Architecture and Resilience on the Human Scale

Cross-Disciplinary Conference
Sheffield
10-12 September 2015

Proceedings
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Dear conference colleagues,

It gives me great pleasure to welcome you to the city of Sheffield on behalf of Sheffield School of Architecture, which is hosting this exciting Conference. Our mission statement offers you some insight into what we are about:

*Sheffield School of Architecture produces graduates who are entrepreneurial self-starters with an exceptional level of political and social engagement, research and business skills. Our mission is to create new knowledge, in theory, in design and practice to help restore the health of the planet and the well-being of communities and societies. We drive this forward through our commitment to building local resilience, developing architectural research practice and working on live projects.*

We are one of the top five research schools of architecture in UK. Following on from excellent ratings (Grade 5) in the two previous Research Assessment Exercise, we are the only School in the UK to have achieved and maintained this level of research performance, the culmination of a long history with contributions from generations of scholars, researchers and students. With 25 active research staff and approximately 90 postgraduate research students, the School consistently attracts external funding for its research and is involved internationally with a range of research projects.

The Platform for Building Local Resilience, from which this conference was developed, is an exciting new initiative in our School. We are currently in the process of developing this project as a new ‘umbrella’ research platform. The platform builds on our pioneering socially engaged research; new forms of praxis and design; digital methodologies and building strong evidence bases in our architectural science research.

I hope you enjoy your time here in the lively heart of this post-industrial city – interestingly, despite its urban location almost three-quarters of the city is taken up by natural vegetation and waterways. More than a third of the city is also located in the Peak District National Park – no other city has a National Park within its boundary. In addition you’ll find 150 woodlands and 50 public parks all within Sheffield and it is rumoured that there are 4 mature trees to every one of the 550,000 people living here. I am glad you will also have a chance to see some of our industrial heritage at the conference dinner.

Finally, if you have a moment during this busy conference, do please come and visit our School at the top of the hill in the Grade 2 listed 1965 iconic modernist Arts Tower in our main University Campus – we always welcome visitors!

Fionn Stevenson  
*Head of Sheffield School of Architecture*
Introduction
Architecture and Resilience on the Human Scale: Ethical and political concerns, agencies, co-production and socio-technological strategies in research and practice
Kim Trogal and Doina Petrescu

Introduction

Resilience will be a defining quality of the global 21st century. As we approach the unknown and unpredictable effects of climate change, and the multiple challenges of resource depletion, loss of welfare and economic crises, we know that our current ways of living are not resilient. Our urban infrastructures, our buildings, our economies, our ways of managing and governing are still too tightly bound to models of unrestrained free-market growth, individualism and consumerism. Research has shown that the crises arising from climate change will become increasingly frequent and increasingly severe. What is also known is that the effects of climate change are not evenly distributed across places and people, and neither are the resources needed to meet these challenges. We will need place specific responses that engage with, and emerge from, citizens ourselves.

This is the Sheffield School of Architecture's position paper that accompanies the 'Architecture and Resilience on the Human Scale' conference, held in Sheffield (UK) 10th-12th September 2015. The conference focuses on research, spatial strategies and projects that are testing how we can build local resilience in preparation for major societal challenges such as climate change, scarcity of resources, increases in extreme weather events, shifts in demographics and so on. We are interested in discussing how architecture, urban practices and related fields can make a transformative contribution at a neighbourhood scale. We are also stating that architectural thinking has the strength to allow a cross disciplinary stitching across the conventional silos of humanities, social sciences, arts, science and technology, and also across research, practice and civic activism, such as the papers in this conference demonstrate.

How then, can we help build resilience? Can we do it through new forms of design? Through new social and technical innovations? Through new economic models and forms of collective governance? Through new research methods and engaged practice? What professional skills are needed to do it? As we approach uncharted territory, we need new models of living, working and designing to help us.
Amidst these discussions, and recognising that there are numerous other components that also need to be developed, this position paper does not intend to offer a totalisation of views on resilience but takes a situated approach (Haraway, 1988) to explore some key aspects that have focus the debate in the school in the last years; namely, the possibilities of architecture and architectural research methodologies to contribute to building resilience, specifically by maintaining an ethical and political engagement dimension to it. The located-ness of practice forms an important aspect of this ethical and political engagement, as well as understanding the ‘local’ as an accessible, unmediated scale for civic action.

Secondly, the paper focuses on co-production as a key component for resilience activity on the human scale. Whilst this is one standpoint amongst many, we recognise that university-community partnerships and notions of “co-producing research” have been increasingly on the agenda, with the belief that knowledge needs to be directed and created with those who need it most. In the field of architecture and planning, this follows a longer tradition of participation and signals not only a move towards ethical forms of knowledge production but new opportunities for collective action in making the city. SSOA has chosen to explore co-production as a fruitful territory for linking research and practice. Also the notion of ‘agency,’ which characterises this active position and the multiplicity of relations that need to be considered in resilient practices is of importance here.

Thirdly, it is in recognition that the built environment, in both its processes of construction and use, is responsible for industrialised, large-scale ecological damage. It is from the impacts of CO2 emissions on climate change, to the effects of deforestation and mineral extraction, excessive water footprints (and more) that the paper posits questions around how to mediate the effects of climate change without recourse to those technologies and means that worsen it. Contemporary advances in architectural sciences and technology enable us to be armed with information to change these circumstances, and is a crucial location for action.

**Architecture and resilience: critical, political and ethical approaches**

Resilience has moved from being a radical term in ecology, permaculture and grassroots movements (Hopkins, 2008) to something like a catch all which “has become the preferred means of maintaining business as usual.” (Diprose, 2015: 44). It is a term that in recent years has been defined by governments and experts, externally to the communities, who should “become resilient” (MacKinnon and Driscoll Derickson, 2012). A simplified definition of resilience as simply ‘being strong’ or ‘bouncing back’ is used ubiquitously, from describing a football team’s victory, workers’ capacities to manage stress, to the Bank of England and chancellor George Osborne’s primary objective to deliver a ‘resilient economy’2. This ubiquity is potentially due to the fact that ‘resilience’ itself, does not say anything about what
is good or bad; it says nothing of the political and ethical implications or motivations for action. With cities rapidly adopting resilience as framework to shape development, it is crucial to question, as underlined by Adriana Allen here, the relationship between injustice and resilience. Allen asks if cities’ new resilience enhancing measures have pre-existing injustices embedded within them? (Allen, this volume) As other papers in the conference demonstrate resilience on the human scale should focus on dimensions of political ecology (Gibson, this volume), such as justice, nature and time, issues of intergenerational equity and ‘ecological economics’ (Faber, 1998; 33).

Whilst resilience is potentially a transformative concept, it is a term that has been ‘turned upside down.’ For this reason, its usefulness in development has been questioned, with journalists noting that it has become essential to an organisations’ survival to frame whatever it is they do as resilient. If we strive in whatever capacities we can to make transformative contributions, then resilience needs to be reclaimed, reframed and practiced in radical and critical ways.

Resilience, as it was developed in systems thinking emphasised certain qualities that make a system resilient, such as diversity; redundancy; connectivity; continuous learning and experimentation; high levels of participation; and polycentric governance (Biggs et al. 2012). These are potentially transformative concepts when thinking about urban locations and development. How can we have, for instance, diversities of tenure, ownership and inclusive access to housing (Pickerill; Montelongo and Wittek; Giorgi, Manzoni and Cattaneo; Glatz and Komlosi, all this volume)? What kinds of diverse economies are being performed (Gibson, this volume) and non-market forms of collectivity and participation (Elzenbauer and Franz; Moore and Bennett, ibid)? Could we have a diversity of not only energy sources, but also modes of their control and management (Rahimian, Domenica Iulo and Llach, ibid), and what is in fact a diverse, creative and participative future for energy? (Tyszczuk and Udall, ibid). Similarly, supporting the ‘redundancy’ of a system requires a different approach to thinking about investment, and how we invest in people and places. Does resilience ‘at a human scale’ suggest supporting a citizen’s income (Trogal, 2014) or new roles for local services in citizen led production (Thorpe, 2014)?

In the field of urban resilience, there has been a recent focus on universities working with cities at an infrastructural level but the scale of the neighbourhood, as the “building block of cities” has received less attention (Moulaert et al, 2010). Recent research has suggested that place based approaches and design methodologies are key in building resilience. Researchers have highlighted a particular need for “placemaking [...] and a] basic infrastructure of public spaces” in building neighbourhood resilience, especially in areas
under socio-economic stress with retrenching local authority services (Platts-Fowler and Robinson, 2013). Others draw attention to the ways that ‘design thinking’ as a synthesising process, and their participative strategies are also key to building resilience (Waterloo Institute of Social Innovation and Resilience, 2012).

A significant part of SSOA’s research, practice and teaching (and indeed a topic for this conference) engages with issues of locality and neighbourhoods. (The Building Local Resilience research platform and the Live Works teaching enterprise at SSOA make explicitly this statement in their programme) It is in recognition that, not only can ecological loops be closed effectively at this level, that new material infrastructures can be made and claimed by citizens, but rather advocates an engaged approach. Recognising that architecture is located somewhere; it is in these places where change happens with people. In the age of climate change and peak oil, resilience requires qualities of ‘social capital’ – trust collaboration, cooperation and leadership- which is rooted in the place where people live (Lewis and Conaty, 2012; 26). In its more radical and critical formulations, it is the only way transformative resilience can really be achieved (Petrescu, this volume). Whilst policy frameworks are of course important, it is through the spatial, social and community practices on the ground that resilience is made.

We aim to recognize this more immediate form of engagement in the growing global context of mega-developments4, whose ‘bigness’ is not only a scale unto itself, as Koolhaas famously stated a few decades ago (1998), but is a contemporary condition for modes of production, delivery and final inhabitation, which are not resilient.5 This conference has been designed to foreground the ‘local’ and the ‘neighbourhood’ as the location which can specifically facilitate citizen action and participation. Importantly, this human-scale is the one most immediately perceptible to us at the level of everyday life. It is a key and essential location from which resilience takes place and has meaning. More autonomous communities are seen as the true ‘resources’6 for ecological transition and urban resilience (Lewis and Conaty, 2012; 28) and significantly it is the scale where democratic governance can take place (Hirst, 1993).

This focus on ‘the local,’ as contributors here highlight, does not mean ‘localising’ structural problems. Rather it is one location from which to challenge and transform them. We need “‘resilience from below’ [and to consider...] how resilience may be associated with ideas of rights, power and agency” (de Carli, this volume). Some of the papers here address this directly; Santacruz for instance, raises the indigenous rights of the Cheran (Mexico), who have moved from resistance and self-defence, to self-determination and self-government for autonomous material and social resiliency. Other key issues raised here include the rights to inclusive, affordable housing (Pickerill, ibid), with others raising questions around common property and collective action (Montelongo and Wittek; Giorgi,
Manzoni and Cattaneo, ibid). Authors pay particular attention to low-income groups and vulnerable inhabitants (de Carli; de Biase and Petrella, ibid), and to the collective agency of those in informal settlements (Paramita and Schneider, ibid). Following Lefebvre’s argument for the ‘right to the city’ (Lefebvre, 1995), we need to create the conditions for a ‘right to resilience’ (Petrescu, this volume), with projects initiating and sustaining grassroots self-organisation and management, creating new social and economic agencies for citizens (Gibson, ibid), as well as new roles for architects, other professionals and local actors (Merrett; Grau, Schoenert and Carpaneto; Moore and Bennett, ibid).

The sustainability of collective actions is also important here (Montelongo and Wittek, this volume), with others analysing the intangible qualities of sharing and mutuality in ‘enduring’ intentional communities (Jarvis, ibid). In the context of local resilience, how collectivity is constituted and what we mean by ‘community’ is important and several authors question forms of belonging and relating that are not rooted in identity and exclusion (Boano; Krasny and Schalk, ibid). They reject an ‘essence’ of community (which ‘local’ approaches risk mobilizing) and instead invite us to consider radically inclusive practices and to think through feminist perspectives on alliance building across difference. This is crucial when, as Daniel d’Oca points out, there is “no shortage of contemporary weapons of exclusion,” (d’Oca, ibid) and as Sally Weintrobe suggests we need a ‘caring imagination’ to overcome processes of ‘distancing’ others in order to build a sustainable world (Weintrobe, ibid).

**Co-Production in Practice based research and Pedagogy**

In a series of discussions on resilience held in the Sheffield School of Architecture in 2013 and since then, staff have emphasized that for them, resilience is not about accepting conditions as givens (the conditions we ‘should be resilient to’), but concerned the importance of the future and having agency in making one’s future. This agency is understood to be collective and located. We reflect on what a critical approach to our own institutional position is, particularly in relation to the city. How do we act, with and for whom, with staff questioning where future strategies for change will come from in conditions of austerity? A number of the papers in the ‘Architecture and Resilience on the Human Scale’ conference, importantly then, engage with issues of co-production in ‘practice’, both the co-production of research and knowledge, as well as co-production of projects and the city more broadly.

Elinor Ostrom and her colleagues introduced the term co-production whilst studying urban services, and used the term to describe the reciprocity between ‘producers’ and citizens involved in the delivery of many public services (Ostrom, 1976). As a practice, it has since
been actively developed in the delivery of public health care (Cahn, 2000) and in these cases co-produced services were found to provide better patient care and increase well being. Increasing evidence over last 15 years supports this (The Health Foundation, 2008).

At the University of Sheffield, researchers across disciplines are working with co-production to specifically engage local communities in research and it is becoming increasingly important for producing knowledge for sustainability and resilience (Polk, 2015). Co-production in the design, making and maintenance of space and buildings is significant in ensuring that those lived spaces actually meet the needs of those who inhabit it. Amongst the other changes we face, is that of aging populations, with authors showing not only how both market and social provision fails to meet older people’s housing needs, but how participatory design research can address these concerns and failures head on (Wigglesworth, this volume). This project, like the other practice-based works in this volume, demonstrate the significance and importance of being located on the ground, working across many levels, confronting theory, policy, research with conditions in lived reality.

Whilst our approach here is to emphasise and highlight those working in located way, it is also in recognition that resilience is made through connections at multiple scales through that location. The notion of ‘agency’ foregrounded in research at SSOA (namely Spatial Agency (Awan, Schneider, Till, 2011), ‘Agency: Working with Uncertain Architectures’ books (Kossak, Petrescu, Schneider, Tyszczuk, and Walker, 2009) has also been explored by a number of papers (de Carli; Paramita and Schneider; Santacruz, this volume) Authors highlight the need for multi-agency responses and partnerships between diverse groups (Fagan-Watson and Burchell, this volume), where the intersection between scales needs to place “equal value on [different] partners expertise” (Roser Gray and Del Signore, this volume) they go on to suggest this can strengthen bottom-up resilience, whilst also shaping policy collaborations.

In considering the ways universities can support communities, attention is also paid to rural contexts, questioning the way universities might best support diverse, indigenous rural development (Wan, Ng, Chi and Li, this volume). Recognising the importance of location-specific approaches for resilience, the ethical questions of difference, not only amongst ‘communities’ but between them, is as important as ever. As authors here suggest, we have an ever-greater need for understanding varied cultural approaches to climate change (and other attendant crises) and the need to understand the varying social impacts in those different contexts (Lawrence and Fellingham, ibid.). The need for different cultural understandings on the human scale, of diverse practices, customs, skills, knowledge and memories is reflected here in many ways. Authors particularly reference the vernacular (Derbyshire, ibid) and others highlight the long-standing success and capacities of vernacular approaches, for instance, in coping with flooding (Ramasoot and Nimsamer, ibid).
The importance of the vernacular is not necessarily only in reference to an architectural ‘type’ or techniques, but rather brings with it the need for those resilient practices, other knowledges and ways of being in the world.

A number of papers bring new tools for locally co-producing knowledge and research on the city, from digital civic surveys (Crowe, Foley and Corcoran, this volume), to geo-timelines to make change visible (Foley and Crowe, ibid), to locative-based social media as tool for co-producing and co-designing (Ip, ibid). Whilst the tools are all different in scope, they all point to the importance of co-produced local knowledge for planning, with authors pointing particularly to an openness of production, which can be used and developed by others elsewhere (Foley and Crowe, ibid). In many ways taking on qualities of the ‘vernacular’ as something shared and developed collectively, i.e. a commons.

A number of papers bring the possibilities for co-production through pedagogy, working in ‘live’ situations. Here university work, both research and teaching, becomes a testing ground for new social and environmental development, testing ways to foster a “common agency” and “strengthening modes of co-production with inhabitants” (Stollmann, this volume). In these initiatives universities acts as brokers between levels (Butterworth and Mackay, ibid), with authors concerned with the ethics of longevity (how to build resilient partnerships); or the building of skills for resilience, such as learning how to participate and to respect difference. These and other skills are ones that can only be developed in interaction with others (Bernardt, van Assen and van Spyk, ibid). They also enable the development of skills for self-initiated projects, with authors reflecting on how these ‘live’ pedagogical projects actions can initiate new collective activities in the long term (Denicke-Polcher, ibid).

The relationship of architecture to resilience is also being explored by practitioners through Architectural Research Practice (ARP). Practitioners are engaging with a wide range of issues and use variety of research methods to explore technical solutions for climate change adaptation of buildings (Baker, Bauman, Winder, this volume), co-production methods for designing of new neighbourhoods (Grau, Schoenert and Carpaneto, ibid), developing new forms of renewable energy within building facades (Flynn, ibid), and addressing issues of inclusion/ exclusion in urban design and strategies for resilience (D’Oca, ibid).

Not only are the kinds of knowledge and skills we develop key to resilience, so are practices of learning, which also need to become embedded. Authors bring architectural pedagogy as a site for change, whether it is creating more cohesive forms of pedagogy around ecological resilience and building systems (Fannon and Laboy, this volume) or
teaching local energy transition in ‘live’ contexts (Bernardt, van Assen and van Spyk, ibid). Initiatives enable experiential learning environments, bringing resilience into a kind of immediacy, resilience aims to be both topic and process.

**Science and Technology for Resilience**

In working towards more ecologically and socially just futures, we need science and technologies (new and old) to help us make sense of changes, and help inform judgments around how we build (literally) that future. Whilst ideas of ‘future’ often invoke certain images of ‘smart-ness’ and smart technologies, interestingly here a number of authors are rather concerned with the production of knowledge, which potentially uses ‘high’ or smart technology and computation for research, but the kinds of technology involved in construction are themselves varied, and culturally and socially specific. This is evident for instance in the collaborative construction undertaken in the Ludian County (Yunnan province, China), with researchers working with a family to reconstruct their home respecting traditional cultures and their autonomy, yet supported by science to ensure seismic capacity, thermal comfort and low cost (Chi, Ng, Li and Wan, this volume). Questions of autonomy, particularly in relation to energy, are raised in different ways, from work on ‘resilient homes’ and the self-provisioning of energy regardless of income (Roaf, ibid), retrofitting much loved existing dwellings for energy neutrality (Dobbelsteen, Jonathan and Kruizinga, ibid), or finding passive solutions for adaptation to climate change (Vogiatzi, Pelsmakers, Altamirano, ibid).

Yet the kinds of knowledge we can produce and how we do so is under question here too. The inevitable gap between model and reality, however dynamic ones model, must be under consideration. One path, the development of more accurate models, is the one most present here. Developments include building frameworks to simulate site-specific climate change adaptation, particularly at a neighbourhood scale (Peng, this volume), where computational modelling can help analyse performances in context. Others include developing simulations to explore urban microclimatic changes and the connected increases in energy consumption (Yoon Yi and Peng, ibid); the coupled relation between future climate change and predicted energy consumption is also under analysis here (Honglian, Liu, Shusheng, Xujie, Liming, ibid). Other authors bring examples of integrating socio-technical aspects to simulations, analysing how difference in the behaviours and practices of building inhabitants can be applied to simulate and test differences in performance (Xexakis, Dobbelsteen, ibid).

Some authors here, work not with prediction, but with the evaluation of the built, lived reality and emphasise the importance of learning from those now occupying new (or retrofitted) buildings. This is particularly important in assessing how well developments meet
their claims, to be for instance in being low carbon (Gupta, Kapsali and Gregg, ibid). There are new possibilities proposed for methods of making post occupancy evaluations (Barbosa Villa, Vigidal de Lima, Gerrefa, Lemos, ibid), as well as the evaluation of new collective housing types, here co-housing, in terms of their resilience and ‘redundancy’ qualities (Stevenson and Narozny, ibid). In these cases the knowledge of how a project meets the varying needs and preferences of inhabitants, the actual energy savings made and cost implications are important to feedback if architecture is to improve. Analysis of the built environment here, is importantly not confined to dwellings, but extends to examine urban networks, analysing social-spatial effects of connectivity and movement in building resilience (Goodship, ibid) or the effects of rivers and ‘blue corridors’ (Pattacini, ibid). Other authors explore using responsive technologies and ‘cognitive tectonics’ (Méndez-Váquez, ibid), or technologies for ‘post-event’ recovery, but again working with close evaluation of the specificity of regional climates and context (Ladipo and Reichard, ibid). Collectively, this diversity of approaches is important in meeting the complex and specific needs of different people and places.

**Conclusion**

We hope this conference contributes to new insights to the theory of resilience, especially by focussing on the ‘human scale’ perspective. The practical solutions and concrete suggestions presented in the conference papers might hopefully contribute to new approaches to resilience in architecture and connected fields, and have an immediate impact on communities and practices who are on the front line of dealing with the effects of global change. The new critical, political and ethical approaches and the socio-technological strategies that this conference put forward as well as the notions of Agency and Co-production as instruments for generative, active and evaluative projects should be contributing to the debate on resilience and providing innovative new forms of inquiry leading to more appropriate solutions to the current global crisis we face.

**References**


Notes

1 For these reasons, this paper does not mention all papers in the conference and all topics discussed, but focuses on those which are closer to what we have defined as the school theoretical position. However this is not at all an indication of quality of for the papers.


3 See for example, the ARCC-network (UK) or the FP7 Critical Infrastructures Preparedness and Resilience Research Network.

4 Here we refer to the rapid construction of mass areas of cities, such as those documented the recent MOMA exhibition, Uneven Growth: Tactical Urbanisms for Expanding Megacities. The exhibition looked at the ‘mega cities’ of Rio de Janeiro, Mumbai, Shanghai, Istanbul, Hong Kong, Lagos and New York, and in a number of cases on mega-developments, in those cities. We also refer to the large-scale (re)developments and reconstruction of ‘old’ cities such as those hinged on Mega-Events, such as the Olympics (Barcelona, Sydney, Beijing, London, Rio), and FIFA World Cups etc.; which far from seeming as a ‘one-off’ set precedents for the dominant mode of delivery of urban development (Raco, 2014).

5 See for example the recent work for the MOMA exhibition: Uneven Growth: Tactical Urbanisms for Expanding Megacities.

6 We put the terms, ‘social capital’ and ‘resources’ in inverted commas as whilst they are the terms used by the authors (Lewis and Conaty), we also recognize that they derive from (and potentially perform) a particular economic way of viewing of both people and relations.

7 Please see for example Kate Pahl’s projects such as: “Ways of Knowing. Exploring the different registers, values and subjectivities of collaborative research” https://waysofknowingresearch.wordpress.com (Accessed 27.08.2015), “Imagine. The social, historical, cultural and democratic context of civic engagement: imagining different communities and making them happen.” http://www.imaginecommunity.org.uk (Accessed 27.08.2015) and The University of Sheffield’s, Research Exchange for the Social Sciences work in this area: https://www.sheffield.ac.uk/ress/coproduction.

Dialogue 1

Building Local Resilience: Bricks and feelings
Building Resilience in the Built Environment

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ABSTRACT
An understanding and appreciation of why resilience is important, what it means at the building and settlement level and how its tenets can be used in design and refurbishment is vital in a rapidly changing world. A range of risks and opportunities for buildings and their occupants will be outlined, referring to the Built Environment Adaptation Indicators being developed for, and with, the Scottish Government. The underlying premise developed here is that if you can’t measure it, you can’t manage it, as we try and build social, economic and environmental resilience in a rapidly changing, and increasingly non-linear world. The core of the paper deals with the need to intelligently anticipate what the future holds in order to ‘Bounce Forwards’, rather than to bounce back to failed models. This talk will promote the idea that at the core of successful solutions to future building archetypes must be the striving for affordable, low impact and universally accessible comfortable places. It outlines the gradual decline of the climatically designed building, the rise of central heating and air-conditioned solutions, the deterioration of the performance of buildings themselves as climate ameliorators and the role of standards and regulations in that decline. It then briefly touches on recent attempts to reverse this decline with ideas of energy efficiency, as exemplified by the Passive House movement in the 1990s, Sustainability in the Active House model of the 2000s and the need to upgrade those models to create truly resilient homes. The resilient home, called the Ecohouse model, promotes buildings that are run for as much of the year as possible on free natural energy from local eco-systems, generate their own heat and power and provide safe havens even in the most extreme weather for their occupants regardless of income.

Introduction
We live in a non-linear and unpredictable world, a world of boom and bust, of war and infra-structural collapses, where rapid change and uncontrolled growth is driving the collapse of established systems. Cavalier debt markets have driven top-down macro-economic failures even in the so-called regulated economies. The bottom up collapse of the housing markets in the USA in 2007-2010 caused an economic maelstrom fuelled by debt and the current collapse of the Chinese stock market appears on the verge of triggering a global economic crisis at least equal to the scale of the 2008 – 2010 global economic crisis. These events are also happening against a the unedifying backdrop of a gradual trend in the degradation of the physical, social and environmental infra-structures of nations, that included the systemic increase in the wealth gap between the top 5% and the rest of the 95% of earners across many societies. The phenomenon of the disappearing middle classes
is one that will inevitably be exacerbated in the current evolving global economic climate. Such trends are set against the atmospheric backdrop of a warming climate and significant increases in the scale and intensity of extreme weather events.

**Systems Increasingly Fail as Temperatures Rise**

<table>
<thead>
<tr>
<th>Temperature Increase (°C)</th>
<th>Building Resilience</th>
<th>Community Resilience</th>
<th>Infrastructure Resilience</th>
<th>System Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1°</td>
<td>Mostly business as usual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2°</td>
<td>Low resilience</td>
<td>Low resilience</td>
<td>Low resilience</td>
<td>Low resilience</td>
</tr>
<tr>
<td>3°</td>
<td>Medium resilience</td>
<td>Medium resilience</td>
<td>Medium resilience</td>
<td>Medium resilience</td>
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<tr>
<td>4°</td>
<td>High resilience</td>
<td>High resilience</td>
<td>High resilience</td>
<td>High resilience</td>
</tr>
<tr>
<td>5°</td>
<td>Very high resilience</td>
<td>Very high resilience</td>
<td>Very high resilience</td>
<td>Very high resilience</td>
</tr>
</tbody>
</table>

How can we reinforce our societies against such trends and the many complex systems we operate in to secure a safer future for ourselves and our children? How can we increase our resilience to the exigencies of unpredicted events in this non-linear world? This paper promotes the idea that a critical factor in building stronger societies is, rather than concentrating on increasing the wealth of the top five per cent, to concentrate within individual communities on reinforcing the economic viability of those at the bottom of the social stratum – and the buildings they live in. By identifying the most vulnerable groups in our societies and enhancing their ability to achieve acceptable and affordable lifestyles the social bedrock of our systems will be stabilised providing more solid and secure foundations on which to building a truly sustainable society.

**Resilience**

It is important to understand what we mean by Resilience. It is variously described differently by engineers, ecologists or system scientists and it is, indisputable, an attribute of
social and physical systems that is increasingly discussed (Zolli and Healy, 2102) and sought by planners, architects, engineers and politicians alike. The technical definition of resilience for material scientists is the property of a material to absorb energy when it is deformed elastically and then, upon unloading, to have this energy recovered - the ability to bounce back to normal after a testing event. Systems all around us are visibly failing from Syria to Greece and currently in the South East Asian, and consequently global financial markets. It is proposed here that our fundamental understanding of the idea of resilience and its implementation is key to creating affordable and achievable reinforcement to systems.

The amount of resilience in a system is defined by material scientists as the maximum energy (stress) that can be absorbed per unit volume without creating a permanent distortion as can be calculated for metals, for instance, by integrating the stress-strain curve from zero to the elastic limit (Campbell, 2008). Stress is placed on the material which reaches a yield point, then there is the bandwidth of strain it can absorb before it reaches its maximum strength and then fractures. With a metal, as with socio-economic systems, the fracture points also changes with the temperature of the material.

One premise of this paper is that we need to be able to define the amount of stress in a system that can be absorbed before it begins to yield to that pressure. If we use as an analogy the housing sector a key stress factor might be associated with rising energy prices that within certain households may no longer be paid in full and the system has to yield, with lifestyles no longer being able to be maintained at the same standard. The extent to which the ensuing stress can be tolerated within the system will depend on a range of factors like how many savings a person has, how old or sick or fit a person is.

Such factors will define the bandwidth of the adaptive opportunities available for people to exploit to take the extra strain before the system collapses and does not ‘bounce back’ and so suffers permanent distortion. This may involve people getting ill or being hospitalised. At some point the system will fracture. No more stress can be tolerated. People die. Without being able to define those three properties of the system: yield behaviours of the system, adaptive capacity bandwidths and fracture points, planners, designers and politicians have not sufficient information to be able to intervene to enhance adaptive capacity and prevent system fracture and collapse.
Fig. 2. shows the characteristics that are involved in this definition. Stress is placed on the material which reaches a yield point, then there is the bandwidth of strain it can absorb before it reaches its maximum strength and then fractures. With a metal, as with socio-economic systems, the fracture points also changes with the temperature of the material.

The metallurgists definition: Resilience is the area under the linear portion of a stress-strain curve is the resilience of the material (Campbell, 2008).

The rate at which stress is applied to an inanimate non-learning metal does not affect the strain at which it fractures because the metal simply mechanically performs to its limits. In ‘learning’ ecological systems the rate of change, a product of the rise (scale of the stress) and the run (scale of the strain) of the process over time, can be significant. Berkes et al. (2008) point out that in a rapidly changing world socio-ecological systems either evolve or do not survive. The function of that evolution is to increase the strain the system can absorb before collapse occurs.

The risk of a system breaking in relation to climate change in the built environment has been disaggregated and characterized by Crichton as having three vectors (Crichton, 1999; Roaf et al., 2009):

- **Hazard**: how bad is it going to get? How large is the stress placed on the system?
- **Exposure**: where are people situated in relation to that Hazard? How exposed is the system to the hazard and how likely is it to happen, how often and how hard?
- **Vulnerability**: how likely is the combination of the above to prove lethal? What strain can the system take? What are the adaptive opportunities and potentials of the system? What properties of the system can be strengthened to reduce the risk of system failure?
The idea of resilient systems can also provide capacity for renewal and innovation in the face of rapid transformation and crisis’ (Berkes et al., 2008). Here the idea of innovation being a key tool for those trying to build resilience into the system is important, but innovation is needed not only in the economic landscapes of for instance the housing system but also in the development of physical innovations and the re-setting of the way in which we view the problem in relation for instance to the design of buildings.

Wilson (2012) proposed a definition of resilience as:

‘The capacity of a system to absorb disturbance and reorganize while undergoing change to still retain essentially the same function, structure and identity, and feedbacks… resilience is measured by the size of the displacement the system can tolerate and yet return to a state where a given function can be maintained.’

Holling (1978) noted that ‘Placing a system in a straightjacket of constancy can cause fragility to evolve’ and all too often in recent years this fragility, or brittleness, of the fabric of the built environment has proved lethal in terms of the thousands of lives and buildings lost to flood, heat, cold or winds as well as proving catastrophic for the livelihoods and communities involved. It appears short sighted to consider it acceptable to repair a system to a state where it can return to the point at which it failed previously and rational to support investment in systems that ‘bounce forwards’ to more resilient states, capable of withstanding the next event of a similar magnitude.

System complexity and vested interests often confound pundits and politicians alike and nowhere more so than in the field of climate change legislation, where the overwhelming power of lobbying groups to impede the development of resilience is widely recognised as a core problem. Lazarus (2009) points out that the building of resilience is a ‘Super Wicked’ problem in which additional barriers to the evolution of the system are imposed by those with vested interests in a non-evolving system. He proposes, for instance, that to be successful over the long term, climate change legislation will need to include institutional design features that significantly insulate programmatic implementation from the undue influence of powerful political and economic interests propelled by short-term concerns.

Hardin (1968 and 1994) developed the idea of the Tragedy of the Commons to describe the dilemma that arises from the situation in which multiple individuals, acting independently and rationally consulting their own self-interest, will ultimately deplete a shared limited resource, even when it is clear that it is not in anyone’s long-term interest for this to happen. His ideas were taken up by many attempting to rationalise why in the face of our growing knowledge base decisions were being made that appear to push progress into socially, environmentally damaging directions. All of us wanting and having more would inevitably push local ecosystems, and in turn, economies, beyond their capacities. Stiglitz
(2012) highlighted the profound dangers of ‘asymmetric information’ where some individuals have access to privileged information that others don’t causing unfair advantage that can result in system collapse in itself. The Planning Gain payments to local councils described above is an example of the ‘Perverse Incentives’ fostered within the system to the benefit of the privileged few who can play the system, to the cost of the many who don’t know the rules. Increasing numbers of authors suggest that the internal mechanisms of neoliberal and turbo-capitalism, devoid in such ways of values of fairness, trust and civil responsibility are to blame and will inevitably take us to the cliff edge highlighted by Hardin and Stiglitz and others (Stiglitz, 2012 and Jackson, 2011; Heinberg, 2011).

Many authors point to the confounding nature of the high level of complexity of the systems in play and their feedback loops, and the problems associated with our reliance on trend extrapolating models in forecasting and predicting the performance of systems. Ayres (1999) specifically points out that to forecast ‘turning points’ it is necessary to get away from trend based models as were used in extrapolation but goes on to point out the weakness of trying to characterise too many complex non-linear interactions with limited differential equations such used since the early year of Ecological modelling and in the original Limits to Growth model by Meadows et al. (1972). Ayres claimed that simple quantifiable models will not be adequate to identify timings and other attributes of Turning Points but that ‘naïve intelligence and intuition may be the best tool for coping with a very complex and non-deterministic future’.

Adaptive Capacity

In the background documents for the third report of the International Panel on Climate Change (IPCC, 2001) the concept of Adaptive Capacity, was developed in relation to the Vulnerability of populations. At a national level Vulnerability is determined by factors such as economic wealth, technological opportunities and infrastructural resilience, information and knowledge, and equity and social capital. In published literature explored, both the determinants of and indicators for Adaptive Capacity are typically given at a country level, rather than in relation to the risk level of an individual sector, person or household (Metzger, Rounsevell et al. 2006) and definitions for key adaptation terms are not often associated with methods for their quantification (Stadelmann et al., 2011, IPCC, 2007; Levina and Tirpak, 2006). Key data collection and analysis methods for adaptation typically deal on one hand with high level measures such at Gross Domestic Product (GDP) or are specific to local community level factors (Wilson, 2012).

While adaptive capacity can potentially cushion the impacts of climate hazards, Berrang-Ford, Ford et al. (2011) and others have noted that adaptive capacity does not necessarily translate into adaptation not least because of the Wicked complexity of the issues involved.
A point in case can be presented as recent trends in house design and development. To what extent do they offer home owners secure and affordable comfort, for instance in the future.

The idea that adaptive capacity is maximised in richer populations and regions is flawed. A study dealing with the housing crisis of Arizona in 2007 – 2010 (Roaf, 2014) concluded that value led and market driven choices had led people in the Arizona Valley to live in homes too large, too far from work and run on inefficient air-conditioning systems run on increasingly expensive energy. These choices contributed largely to their inability to pay their mortgages when energy costs doubled in a few months and the fact that in greater Phoenix and Maricopa County some 265,000 homes were recorded as empty in the 2010 Arizonan census. It was argued that if people had been willing to settle for smaller, less ‘flashy’ homes that were run on abundant and increasingly dominant (Aanesen et al., 2012; Kirkegaard, 2010) solar energy potentials the number of foreclosures could have been significantly reduced. The adaptive capacity that failed here was demonstrated to be the ability of local homeowners to absorb the accelerating costs of energy into their daily budgets – the Macawber factor. Overnight they began to spend more than they earned and the housing system failed, toppling the first domino in the largest global economic crisis for a century.

The Importance of Comfort building success

Comfort is a very costly business. Around 40% of global GDP is spent on buildings, for their construction, operation and demolition. Most goes in keeping buildings cool or warm enough to occupy - using air-conditioning and central heating systems. That was fine in the age of cheap 20th century energy but as fossil fuels run out - how will we afford to stay comfortable in the increasingly extreme weather systems we occupy?

The IPCC’s 5th Report on climate change rings lots of alarm bells, providing clear evidence of the often devastating impacts of a warming world (www.ipcc.ch/report/ar5/). In 2014 alone, many people died as Southern Australia sweltered in the grip of an unprecedented heat wave in January and when North America experienced a catastrophic freezing period in November. How can people stay warm / cool in their own homes in such extremes if they can’t afford to pay for heating and cooling energy in ordinary weather?

In the 1990s – as concerns about climate change began to impact designers became aware of the need to mitigate the impacts of global warming and became obsessed with Energy Efficiency as did the author (Roaf and Hancock, 1993). In Europe movements like Passive House (www.passivehouse-international.org) started that were suited largely to European climates and required several simple steps to be taken to include:
• Insulation
• Good Windows
• Air Tight construction
• No thermal bridging
• Heat recovery systems.

Then in the 2000s came the rise of concerns of the broader subject of Sustainability (Roaf et al., 2004). In Denmark the Active House (www.activehouse.info) group rose to the challenge and had a model that included a wider range of design features including:

• Thermal Storage
• Natural Ventilation
• Adaptive Envelope
• Active solar / renewable energy systems

This was a huge step forward from the flawed Passive House model that all too often promoted over-sized and fixed windows, and inherent in the design mix was the important of adaptive opportunities. But like the Passive House homes, some features in particular like the concentration on roof lights and over-large windows regardless of orientation, they did not account for issues of overheating for more extreme hot weather events.

The advantage of the parallel British Ecohouse movement (Roaf et al., 2012) was that from the get go it understood that buildings must, and will increasingly have to be, design not only to minimise their impacts on climate change but also to adapt to more extreme weather in a rapidly changing climate in a warming world. Eco-buildings are often designed to include Climate Refuges where occupants can find safe and comfortable havens, however extreme the weather outside. Ecohouse design promoted:

• Climate Ready & Future-Proofed buildings
• Run on Solar / Renewable Energy with Storage of heat and coolth within them
• A wide range of adaptive opportunities & easily usable controls
• Buildings in which behaviours are deemed part of the Solution – not a problem

Many architects and engineers today are hampered in their design of resilient buildings because they systematically use complex and inaccurate building models that are not capable of designing low energy buildings with embedded thermal and electrical storage, complex natural ventilation systems and unpredictable behaviours. This is why we have come up with a more simple approach to the design of resilient buildings that disaggregates the design process to stages in orders of magnitude of impact on the both comfort and energy use to show a new way forward for future facing design.
Designers need to work on three different design levels in three distinct stages:

**Design Level 1: Everything you cannot change about a building**

This includes Form (footprint in two D and section in 3D) – Orientation – Openings – Height in Sky – Depth in Ground – Floor to Ceiling Heights – Structural / Roof Overhangs – Materials / Mass\(^1\) – Emissivity / Absorbance of surfaces etc. These are what determine the basic ‘pulse’ of a building, how coupled to, or de-coupled from, the outside weather the internal climate is.

![Fig. 3. Level 1 design determines how ‘Well-Behaved’ a building is in terms of its internal climate.](image)

These three examples show UK buildings that if they are good have very stable indoor climates, if they have too much glazing and tend to overheat are So / So buildings and if they are glass boxes are very bad Level 1 buildings.

**Design Level 2: Adaptive Opportunities - Things about a Building that you Can Change.**

These may include U-values / Occupancy / Internal Loads / Opening Windows / Infiltration / Furnishings / Clothing / Local-Central Heating /Cooling systems / Shades / Curtains / Blinds / Conservatories / Porches / Landscape. Comfort often results from peoples behaviours that take advantage of these Adaptive Opportunities to improve their comfort.

The problem today is that many building designers only know how to use energy consuming heating and cooling systems to improve comfort and have forgotten all the old ways of passively achieving comfort with behaviours. Thus you might have the same type of Level 1 So / So building but it can either be a good or a bad building depending on whether
the full palette of adaptive opportunities are taken advantage of or not as shown in Figure 3. The trend to mechanisation of buildings was driven by Building Standards with only a very narrow acceptable temperature band that made air-conditioning a necessity. However good designers now use Adaptive thermal Comfort Standards with broader temperatures ranges suited to local climates (Nicol et al., 2012 and Humphreys et al., 2015). Many modern architects are also poorly trained in issues of building performance and more keen on Wow Factors than Comfort when designing as dealt with in our Design Level 3 and Figure 5 below.

![Diagram of high and low energy buildings](image)

**Fig. 4.** Too many HVAC Engineers and Architects no longer know how to use the full range of passive opportunities to achieve comfort but just rely on energy expensive mechanical systems.

**Design Level 3: This level is all about the Mind**

How we perceive or sense or feel the building. Just imagine you are walking into a room for the first time and you will develop an instant first impression on just how comfortable it will be or how happy or well you will feel inside it. These feelings may be to do with a View – Art - Sounds - Scents –Style - Colour – Light - Formal Composition of Shapes - Decoration - Furnishings - people / events associated with the building and so on.
Fig. 5. The impressions a building or room might give you can range from instant shock and awe to much deeper and more durable feelings of well-being and happiness.

Paradigm Shifts in Concepts of Comfort enable the use of Natural Energy

Only once one has established an effective and locally appropriate building archetype that is capable of producing a well-behaved and climate safe Level 1 building that is appropriate for the local climate and social and economic context is it then time to move on to explore the Level 2 Adaptive Opportunities that will help fine tune its energy efficiency in relation to its core function of providing an acceptable, comfortable or even delightful thermal environment. Comfort, without machines, here is the measure of the success and resilience of a building as well as its mechanical energy efficiency.

Integral to a truly low energy building is the need to naturally ventilate it for as much of the year as possible – and to allow this to happen a revolution in comfort approaches is necessary. Fortunately this is happening fast. In the 2014 Windsor Conference on the subject of Counting the Cost of Comfort in a Changing World (Roaf et al., 2015a) a whole new spectrum of strategies for the provision of real, local, comfort were presented, designed to promote the well-being of people within buildings and spaces at low or negative carbon costs. The 20th Century concepts of comfort were predicated on a dated model that involved the using of cheap fossil fuel energy to run ubiquitous, mono-functional, climate conditioning systems as shown in the high energy Level 2 building in Figure 3. This increasingly financially and environmentally unaffordable model is now being rapidly superseded by a
new 21st century comfort approach with very different trends including (Roaf et al., 2015b; Brager et al., 2015):

1) **From Active to Passive:** Only heat / cool buildings when absolutely necessary - naturally ventilate them for as much of the year as possible. Architects and Engineers will have to re-learn the skills they lost in this field when they fell into the thrall of high energy machines. The myth of ‘efficiency’ is pervasive - but why use machines at all if you don’t need to?

2) **Heat / Cool the people not the building:** A strong move is back to using what the Californians call Personal Environmental Technologies (PETs) – like small heaters, fans or air-conditioners to provide local comfort for individuals within low (or high in cold climates) background temperatures. Crucially small local PETs used to heat / cool people during extreme events also negate the need to over-size mechanical systems to meet peak loads.

3) **Adaptive Behaviours are a key part of the comfort equation:** Include lots of opportunities for people to adjust themselves and their buildings to achieve comfort - including shutters, curtains, shades, screens and the ability for people to move around spaces in buildings.

4) **From still to breezy air movement:** Most of the early work in comfort was done in climate chambers in northern Europe and the whole 20th comfort approach defines air movement as ‘draughts’ – a very bad thing. In fact breezes are very different and can be harnessed to enhance comfort and people really do like ‘fresh air’.

5) **From Neutrality to Delight:** Stop thinking that the only way to provide comfort is to put people in a uniformly warm / cool room soup. Re-learn how to make people *sense* ‘thermal delight’. A cosy fire in winter or a cool breeze can trigger sensual pleasure and enhance happiness and well-being – so why do so few designers design for delight today?

6) **Design Climate Refuges into buildings:** Every home should have a cool / cosy corner so that people (particularly the old and the young) can stay warm / cool there during extreme weather. You just need one room to be safe during such periods.

7) **Time and Place are key - Harvest comfort from the micro-climates in and around buildings:** Every place, site, aspect, room will have its own micro-climate that, once understood, can be used to provide more or less comfortable locations for different activities over a year. The thermal landscaping of a city, site or building can be done effectively with the many tools available from planting and shading to sun trap walls and sun-catching bay windows. *The building is not a box* plonked on the site but a complex intervention in the flows of people, resources and climate, in and around it.

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Resilience means doing more for less and minimising vulnerability to extreme events, with comfort.

**Measuring Adaptation and Resilience**

‘If you can’t measure it you can’t manage it’, as the old maxim goes. But how to measure such issues in practice as increasingly being required of the professions and governments alike in their drive to develop designs and policies that can effectively reduce and manage the impacts of change on their social, economic and physical systems. Scotland has pioneered the development of locally appropriate Adaptation Indicators within the framework of a Scottish Climate Change Adaptation Programme (SCCAP) (Beckmann and Roaf, 2015). A critical set of indicators relate to impacts on populations in the contexts of the built and natural environments and are being developed to expand the Scottish programme of Climate Adaptation Planning and ‘Informed Decision Making’. To do this requires a focus on deliberative policy making to formulate both Policy Targets and Action Plans aimed at:

a) Reducing our exposure and vulnerability to the risks inherent in a changing climate.
b) Exploring ways of exploiting any opportunities that may emerge with climate change.
c) Developing a sound adaptation policy framework as is increasingly understood as being critical to the encouragement and enablement of countries to bring about planned adaptation that will build resilience in their populations over time.

This part of a planned *evolutionary* process developed to accommodate and drive timely adjustments, as and when necessary, to enable populations to cope with, and adapt to, new landscapes, buildings and lifestyles in an increasingly rapidly changing climate. It will also be used to identify investment opportunities that might enable Scotland to continually ‘bounce forward’ to positions of greater resilience.

The built environment, being developed at Heriot Watt University, are derived from a risk based approach as this is the basis of adaptation policy making in Scotland (and the UK) with the SCCAP responding to the Climate Change Risk Assessment. It also fits well with the decision making contexts in which the indicators are to be used as many decision makers are already working with risk management processes. Indicators need reliable and replicable data sets behind them and examples of some Scottish Adaptation Indicators for the Built Environment, now numbering over twenty include:

**a) Indicator: Flooding** (Data sources: Scottish Environmental Protection Agency SEPA; Ordinance Survey Master Maps). Eg. Risk of flooding to residential and non-residential property and to cultural heritage / proportion of properties/assets at risk. Action: e.g. proportion of properties at risk benefiting from flood defences and extent of impermeable surfaces in urban areas.
b) **Indicator: Increasing damp and mould in buildings** (Data sources: Scottish House Condition Survey). Eg. Risk: Extent of the damp etc. Actions: New policies on standards for rented homes etc.

c) **Indicator: Energy Demand:** (Data sources e.g. Official Energy Efficiency Ratings; General Register Office Scotland; Scottish House Condition Survey). Eg. Opportunity: Milder winters will reduce energy demand for heating; Risk: e.g. property energy efficiency and average household size; Action: proxies: extent of insulation measures in housing; extent of energy monitoring by occupants.

d) **Indicators for Transport and Flooding:** (Data sources e.g. SEPA, Transport Scotland/local authorities, Scottish Flood Defence Asset Database; Network Rail; Scot Rail). Eg. Risk of flooding of roads, disruption due to flooding of roads, flooding of railways.

e) **Indicators for Transport and Landslides** (Data sources include SEPA floods/flows; Transport Scotland and Local Authorities). Eg. Risk: landslides affecting roads; scour of road and rail bridges.

A new Indicator set for Overheating in Buildings in Scotland is currently being considered (see Ruddell, 2012), and not before time as isobars rapidly creep northwards and it is only a matter of time before the 2003 event when 72,000 people died in Europe in one heatwave event (Larson, 2006) will inevitable be repeated. Once the means to measure policy outcomes are in place then the policies to alleviate anticipated adaptation actions will inevitably follow.

**Conclusions**

In our search for socio-economic resilience in a rapidly changing world both the measures and motivations matter enormously. There is a need for a deeper understanding of where populations stand in relation to economic, physical and social stressors, their ‘Adaptative Capacity’, how much extra physical / economic strain they be tolerated in the real context before system collapse and or degeneration occurs. A basic understanding of the importance of adaptive capabilities is crucial. For instance, when governments need to ratify spending hikes by private and public bodies such as 5-10 percent hikes in transport, water or energy costs do they know the extent to which the ‘Macawber Factor’ will kick in, the point at which the system breaks? Do they even consider the cumulative effects on citizens groups? Do they care if certain sectors actually go over a fracture cliff? We know from Stiglitz (2012) and Lazarus (2009) that excessive concern about such end points may not be in the interests of the ruling classes, and their lobbyists, in many countries. But perhaps this is exactly the time when Paradigm Shifts can and must occur, when millions of citizens turn to running their lives on solar energy, rely increasingly on natural ventilation and turn their
back on market driven solutions to withstand the growing stresses and strains within our economic systems. Who knows?

This exploratory chapter has identified that we need to understand functionalise and maximise our Adaptive Capacity, to identify Fracture Points in our socio-economic systems, to consider long term energy solutions like solar –power, to relearn how to design truly resilient buildings and to identify and measure our own ability to adapt in a rapidly changing world and act accordingly. The choices we have to make about the future are increasingly value driven too - who matters to us in the long run? And who makes that decision? Quis Custodiet Ipsos Custodes? Who Guards the Guardians?

References


Notes

1 http://icarb.org/energy-workshop/
The New Imagination in a Culture of Uncare

Sally Weintrobe

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ABSTRACT We all rely on imagination when undertaking new projects, architects particularly so with their potential to imagine perhaps being their most essential creative asset. Sally Weintrobe argues that the present culture of uncare is damaging to the caring creative imagination and because of this it is vital to understand more about this culture, its aims and its effects. Resilience is being able to withstand the pressure of the culture of uncare to unduly influence how we think and feel; also to understand how and why we collude with a culture that currently promotes such extensive disavowal of climate change. She explores the psychology of imagination, disavowal, and the culture of uncare; also what is needed for ‘the new imagination’ that can envision a sustainable world.

Introduction

Sue Roaf, in a wonderful phrase, called for architects to “reengineer their dreams” to build for a sustainable future\(^1\). This means nothing less than restructuring the architectural imagination.

The imagination needed for our climate crisis is a caring imagination. My argument is a culture\(^2\) of uncare\(^3\) in the global north\(^4\) actively works to break our felt links\(^5\) with the part that cares. It does this to block change and promote carbon intensive business as usual. I suggest we are all, more or less, influenced by the culture of uncare.

Roaf’s phrase, ‘reengineering a dream’, resonates with a psychoanalytic way of seeing: here thinking is an inner, psychic, dynamic building project in which we maintain links with care by keeping those we care for near by us in the internal world of the imagination, close enough to feel touched by them\(^6\). A main way we break links to care is by spatially rearranging our relationships in the inner world of the mind in order to keep people at a distance\(^7\). As ‘distanced others\(^8\)’, we do not care as much for them. An internal world\(^9\) with uncare in charge is an internal world in which our relationships have been reengineered spatially in this kind of way\(^10\). My argument is the culture of uncare works to promote this kind of rearranging which can lead to a distorted inner representation of the external world.

I will look at what sort of caring imagination we need to dream of and to build a sustainable world. I call it the ‘New Imagination’. Embracing the New Imagination involves repairing broken links with care, and forging new links with care. This can be difficult and painful to do, but can also expand the experience of self and of feeling alive\(^11\).
A concept I will emphasize is frameworks of care. The capacity to care is not just part of individual character, but depends on these frameworks of care. Architects build them when they build sustainably.

**The culture of uncare**

A culture of uncare has gained ascendency in the period of globalization since the late 1970’s. It has, by now, been extensively studied by social and psychosocial scientists, with each scholar naming it in turn the narcissistic, perverse, consumerist, extractive, entitled, arrogant, psychopathic, instrumental and manically triumphant, culture\(^1^2\). All these are aspects of uncare, and together these aspects cohere to form a mindset, which I have called the uncaring mindset. It is organized, narrow minded, short-term minded, avaricious, and it tends to be set and tenacious.

The uncaring mindset is at the heart of the culture of uncare. It is driven by a powerful undermining phantasy\(^1^3\) which is that the earth is an idealized indestructible breast/toilet mother, there solely to provide endlessly for us and to absorb all our waste\(^1^4\).

The project to globalize the economy was driven by this phantasy. ‘Grab, grab, grab, now, now, now; undermine as many restraining trade barriers as possible, hide the true costs and let tomorrow go hang’ was the order of the day. Laws were framed and trade agreements put in place to facilitate deregulation. Naomi Klein (2014) has described this process in her latest book on climate change, *This Changes Everything* as has Joel Bakan in *The Corporation*. Deregulation means people working to undermine frameworks of care that hold excessive greed and entitlement in check.

The only possible outcome of globalization driven by a mindset that sees the earth as a breast/toilet mother was a pileup of social and environmental damage and the biggest problem for drivers of the global economy was how to get people to cooperate with an immoral and inherently unsustainable project. Happy carefree consumers were needed to boost profits. The problem was people care\(^1^5\). The need was to reverse the human climate so that people would care too little, not too much. To date, trillions of dollars have been spent on undermining care through working to shift peoples’ bedrock ego ideals of caring behaviour. Undermining care has been brought about through political framing, mass media, the academe, general culture and advertising. It has led to a change in the culture of our social groups towards greater disregard for science, more materialistic values and the idea that to feel as free of care as possible is most desirable, rather than being a warning sign that one is living in a gated community, a psychic retreat, within the mind. All this money would not need to have been spent, and would not have been spent, if people were basically uncaring by nature. Instead, people are caring and uncaring by nature.
The global economy’s business plan was to drive uncare and to disable care, specifically in relation to our behaviour as consumers. The need was for people happily to consume ever more products produced in the cheapest possible way to maximise profits. The true cost was climate change\textsuperscript{16} and rising social inequality. People’s moral qualms, their feelings of responsibility, their anxiety that it would all end very badly, their sense of guilt and their impulse to resist taking part, all stood in the way of the willing cooperation needed.

The new culture that came in had the ideological function of helping people find ways not to care too much about living in a way they knew deep down was morally wrong and unsustainable. The culture’s aim was promoting an uncaring mindset. This mindset has trickled down from corporate power, to governments, to social groups, to the individual psyche.

\textbf{Lawrence Summers’ leaked memo}

Here is an example of the mindset at a corporate level. In 1991, Lawrence Summers, then President of the World Bank, confided in a leaked confidential memo, “I think that dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that. … Just between you and me, shouldn’t the World Bank be encouraging more migration of the dirty industries to the Least Developed Countries?”\textsuperscript{17} Here is the uncaring mindset writ large: outsource environmental damage to those who are far away and without power. Let them bear the suffering.

When this email was exposed, Summers said he was only joking. Presumably this was because he did not want either the bank or himself, as the bank’s leader, to be judged immoral. The problem is people care. They feel guilty and ashamed at having their uncare exposed, and even if they do not, they know others will. This is the main reason why damaging and inequitable trade treaties are negotiated in secret, away from public scrutiny.

Like others, I was shocked to read of Summers’ memo, but I too outsource environmental damage I cause, albeit obviously on a far smaller scale. Here is an example where I saw this clearly.

\textbf{At the bus stop}

I was waiting for the bus, having decided to travel more by public transport to reduce my carbon emissions. It was spitting rain, blowy and cold, and I thought, “I hate waiting for the bus. I wish I’d taken the car”. Suddenly, spontaneously, I imagined my grandchildren overhearing my thought. They were now young adults, not children. In my imagination their world, a future world, was right up close to my world. In my imagination, we were all close enough to hear, see and touch each other; close enough for me to see the extreme weather
they were in and close enough to feel their suffering.

I felt ashamed. Part of my shame was feeling I was so much less of a person than I wished I was, and felt I can be. I felt trivial, fatuous and grumpy, like a spoiled entitled brat. I had heard myself in a different way and with a different perspective. I think this was because I felt a direct loving, empathic, link with my grown up grandchildren. And, because I felt this direct link so keenly, I managed to stay in touch with what I had understood, despite this being painful.

This was that I had, without being consciously aware of it, relocated my own grandchildren to in a faraway place in my imagination, a place I had labelled 'the future', and I had done this in order to sever a caring, loving, link with them. I had moved them from being close to distant so I would not have to feel guilty, ashamed and anguished about my carbon behaviour. Here I was, in an uncaring mindset, outsourcing suffering. In my imagination my grandchildren were now ‘distanced others’ far enough away to be outside the area of my love and concern. I had broken my caring link with their actual future experience so as to assuage my guilt.

I have often thought climate change will affect the lives of my grand children. I now realized this was with real empathy cut off. I had never felt affected like this. Here I believe I had repaired the loving, caring link between us. I had reversed mental distancing and brought them back close to me where they properly belong. This is the sort mental reengineering that I think is required.

The mechanism I have described – that of actively breaking loving links to avoid mental pain - is an ordinary human defence mechanism that can usefully protect us from being too emotionally overwhelmed. My point is that the culture of uncaring boosts breaking caring links and boosts mental distancing on a daily basis. It does this in many ways and through different branches of the culture. For instance, take our social groups. Mine would be more likely say, “don’t be so hard on yourself Sally; give yourself a break. Don’t be omnipotent. Do you really think that your one tiny action of taking the bus is going to save the world?” They would be less likely to say, “Yes, it’s unpleasant waiting for the bus, but stick at it. Perhaps give yourself a break if you are tired or not feeling well. Face how helpless and enraged you can feel that government is not stepping up to tackle climate change.” Or, take our newspapers. They mostly airbrush out references to climate change. For example, at his last inauguration as President, Obama spoke about climate change. The main headline across the mass media that day was did Beyonce lipsync the national anthem? Or, take advertising and general culture. These relentlessly exhort and seduce us to feel entitled to idealized conditions. They encourage the uncaring part of us that I heard in my inner voice at the bus stop.
The aim of this culture is to break links with care and encourage spatial distancing of the victims of our uncare in the internal world of the psyche. The aim is to keep us defended against feeling conflicted and anguished at our collectively damaging way of living.

Disavowal

These distancing strategies are part of disavowal, which is seeing reality but finding ways to remain blind to reality at a feeling level. Disavowal can leave us with highly distorted inner pictures of reality, with people we love far away or in the shadows, with important issues seen as tiny and trivial issues seen as big, with time’s steady march arrested to the present tense only, and with the environmental and social violence that we do carefully airbrushed out of the picture. We sanitize our inner landscapes through psychic reengineering and we do this to protect ourselves from emotional discomfort and pain. The culture, rather than help us face reality, invites us repeatedly to engage in disavowal. In this culture it is very difficult to resist being drawn in.

Omnipotent thinking

One particularly destructive aspect of disavowal is that it attempts to solve problems omnipotently, i.e. through an act of thought, rather than through making repairs in the real world. This is magical, ‘as if’, not rational thinking. My mental distancing is an example of ‘as if’ thinking. It was ‘as if’ I could rid myself of guilt and anxiety through an act of thought. I cut my links to care by locating my grandchildren far away, as if this would solve the problem. At one level it does solve the problem in that it gets rid of consciously experienced guilt. The cost is rationality itself. And, ‘as if’ thinking onely leads to problems getting worse, because damaging behaviour is not addressed in reality.

Genuine care involves mourning the phantasy that the earth is an idealized breast/toilet mother, and attempting to address the damage this phantasy has caused. ‘As if’ care is setting ambitious climate targets one knows will not be kept, or apparently minimizing the danger, or believing in miracle techno quick fixes, or avoiding hearing any news about the damage, or rubbishing the climate science community, or locating the damage in some future far off place, or preferably doing all these at the same time. All these magical repairs work by cutting felt links with care.

‘As if’, omnipotent, fake, solutions can be rustled up in an instant. They require no inner psychic work, which is needed to reconnect with care. Connecting and reconnecting with care is the only kind of work that will lead to real repairs being undertaken in the external world. The true aim of omnipotent solutions is to enable business as usual to proceed. Omnipotent thinking is now so widespread in relation to climate change that any
troublesome aspect of the problem can apparently be dismissed instantly through an act of thought.

At the bus stop I was in disavowal, operating in ‘as if’ thinking mode. I think its purpose was to avoid guilt while still feeling apparently good and virtuous. In a state of disavowal I could write about the effect of climate change on my grandchildren without taking greater care to reduce my own emissions and I could push my guilt about this, and push them, to the edges of my mind.

The New Imagination

The New Imagination is made up of elements that are very old and also very new. It is the caring imagination that we need for now.22 It is very old, because the ongoing struggle between care and uncare is as old as human kind. Homer described this struggle in The Iliad:

\[ \text{destructiveness, sure-footed and strong, races around the world doing harm, followed haltingly by … (care), which is lame, wrinkled, has difficulty seeing and goes to great lengths trying to put things right.} \]


In the New Imagination, care no longer appeases uncare. It is no longer led by the nose by uncare like an ineffectual parent clearing up after a self-centered, triumphant, toddler running amok. Care, in the New Imagination has come of age. It stands up to uncare. It represents the moment when the human race matures, starts to grow up and face reality.

The New Imagination recognizes that because of our environmental and carbon crisis, we are a unique generation, tasked with a particularly heavy burden of care about climate change. The last generation did not have the full picture and if we leave taking care to the next generation or even to ourselves tomorrow, it will be too late.23 The New Imagination recognizes that we face a full-blown emergency but also knows we can address it, and with existing technology.

One strand of the New Imagination is very new historically because only now, with scientific and technological advances and satellite pictures, can we more fully appreciate Earth in her otherness, her majesty and also as fragile and with limits. We now can see that she comprises complex interconnecting dynamic systems that support life. All this enables us to love her more fully and in a more mature way, and be very concerned when we see her damaged. The New Imagination helps us face our true dependency on and indebtedness to the earth. It helps us give up and mourn the narrow-minded phantasy of her as an idealized breast/toilet mother to exploit and think we can control. It opens our eyes to the need to share resources with other humans and other species living now and in the future.
The other strand we need for the New Imagination to flourish is a deeper understanding of the mind and of culture. This enables us to take a more sympathetic and a more critical look at ourselves. It helps us to recognize that care is not best understood just at an individual level. Care flourishes when frameworks of care are in place and it withers without these frameworks. I now move to frameworks of care.

**Frameworks of care**

A framework of care is a structure designed by people who care. It is a sign of background mindfulness. It does two things. It keeps destructive uncaring social behaviours in check, and it actively supports caring social behaviours. Frameworks of care exist at all levels, from laws that prohibit violence and theft, to social groups that disapprove of certain behaviours while also helping people face life’s difficulties, to parents who understand how their child feels and also provide discipline where necessary, to the individual inner moral code we have internalized that regulates our behaviour. Frameworks of care help us maintain our living, direct, links with felt care. They also help us mend caring links when these have become severed. They can do this in many ways. We vitally depend on our frameworks of care, and are often not even aware they are in place, only noticing their effects when they start to break down. A civil society depends on them.

When architects build sustainable buildings they build physical structures to keep people safe. With these structures they are also building frameworks of care and this is a profoundly important aspect of their work and the role they play. The frameworks of care they build are vitally necessary for mental health by keeping uncare in check in psychological as well as practical ways. If we live in a passive or active haus, and travel on carbon ultra-light transport, our carbon emissions drop right down. If our buildings are designed to better withstand ravaged elements, we are safer. This enables us to feel that our survival is cared about. An important insight from psychoanalysis is that to be caring we need to feel cared for. This starts in babyhood with parental care.

Architectural frameworks of care can bring us closer to people, nature and beauty in a way that helps keep our links with care alive. They help us reconnect with being citizens not just consumers in the way they arrange social space. All this expands our sense of self, boosts our creativity and connects us to others in a caring way. All this disrupts the self-idealizing idea that we are somehow superior to some other people and to other species, and entitled to live cut off from them.
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Homer. The Iliad , Book 9: lines 502ff, translation by Michael Brearley, quoted in Engaging with Climate Change: Psychoanalytic and Interdisciplinary Perspectives.


Notes

2 Culture includes mass media, government messaging, advertising, cinema, the arts and our social group culture.
3 I use the term ‘culture of uncare’ rather than ‘uncaring culture’ to emphasise the active way in which this culture seeks to uncouple us from care, i.e. to ‘un-care’ us. This culture is not just uncaring in a descriptive sense. It breaks links with care.
4 A culture widely called ‘American’ or ‘Western’ or ‘of the global north’, is increasingly recognised as largely responsible for rising carbon emissions. However, given its rapid spread to all corners of the globe in the period of financial deregulation since the early 1980’s, and given recent shifts in global power relations, it is no longer accurate to talk of a global north/south divide. A huge poster hanging on the wall of the hotel of the Indian government delegation to the 2014 World Economic Forum in Davos highlights this. It said: “India. World’s Largest Middle Class Consumer Market by 2030. Join India. Lead the World.”
5 Cutting felt links with care was written about by psychoanalyst Wilfred Bion in his (1959) paper Attacks on Linking. In Bion’s model, links involve directly felt experience of a relationship with the other. The other can include reality. My discussion focuses on the way that severing links with experience leads to dissociation, or more properly, ‘dis-association’ from the part that cares. One might ask if dissociation is present in Ben Van Beurden’s interview with Alan Rusbridger, then Editor of the Guardian newspaper. Van Beurden is CEO of Shell. In the interview he acknowledged climate change and the need to reduce emissions, but simultaneously endorsed Shell’s expansion of fossil fuel extraction, including tar sands and drilling for oil in the Arctic. He said, “I think about climate change all the time and I think about it not at all”. Guardian May 2015.
6 Locating the other far away in the imagination so as not to feel touched by them was described by sociologist Stanley Cohen as creating the ‘distant other’. I have looked at dehumanising prejudice as one example of distancing the other through spatially rearranging the other as living apart (apart-heid), on the other side of the mental tracks, and through scapegoating and vilification techniques in order to avoid guilt and shame.
7 I have written of how the culture drives us to split our internal world into near and far landscapes, in which we relate to ‘inferior them’ from a separated-off position of ‘superior us’. Weintrobe (2012a).
8 There are many examples of creating the distant other to stay in a psychic retreat. For instance, when economist Nicholas Stern wrote the Stern Review – which he has now acknowledged did not take the problem of climate change seriously enough - he used an economic model that gave inadequate entitlement to future generations. This is spatial distancing of ‘those in the future’ tucked away and hidden behind the equations. Stern is hardly alone in using the assumptions he did. There is widespread disavowal of genuine consequences for future generations in the models used by economists.
9 I find psychoanalyst Melanie Klein’s (19 ) concept of the internal world very useful to understand the way we form an internal representation of the external world, one that can be heavily influenced by phantasy. In Klein’s view, relationships feature prominently in the internal world. This is because we are primed to relate and are
primarily social as a species. She sees the internal world as literally ‘peopled’ by figures made up of realistic representation and distorting phantasy. My emphasis is on the representation of space internally, often envisioned as inner landscapes.

10 Psychoanalyst John Steiner (1993) discussed the way that we can form what he called a psychic retreat in the mind. This is an area, often imagined as a sectioned off place, in which we ‘arrange’ the internal world so as not to be troubled by various sorts of anxiety or feelings of loss. Here I am suggesting our culture helps foster a collective psychic retreat from anxieties and psychic pain about our damaging environmental and social behaviour.

11 Sociologist and psychosocial theorist Michael Rustin (2001) has written on structures needed to facilitate care. He says, "In what containing social environments, can human beings tolerate recognition of the truth, and thus of each other’s states of mind, desires, needs and sufferings? This is a rather fundamental question for political and social thought, and is one to which psychoanalysis still has a large contribution to make." Rustin (2001) Reason and Unreason. p. 6.

12 Social psychologists have called this mindset ‘instrumental’ (Kasser, Crompton, Darnton and Kirk). Sociologists and social commentators have called it ‘consumerist’ (Z. Bauman, N. Klein, Hamilton, Alexander) and ‘extractive’ (N. Klein). A lawyer has called it pathological and institutionally psychopathic. He distinguishes between a psychopathic corporate culture and individuals who work for it. Psychoanalytic authors have given the mindset various names: ‘narcissistic’ (Lasch), ‘narrow-minded’ (Brenman), one of ‘arrogant greedy entitlement’ (Weintrobe), ‘perverse’ (Long; Hoggett) and involving a sense of ‘manic triumphalism’ (Segal).

Fantasy spelled phantasy indicates the phantasy is or is mostly unconscious.

14 See Keene (2012) for discussion of the earth as a breast/toilet mother phantasy.

15 As Freud sagely put it, people may not be as moral as they would like to think they are but they are more moral than they realize.

16 Strictly speaking ‘global warming’ refers to the long-term trend of a rising average global temperature and ‘climate change’ refers to the changes in the global climate, which result from the increasing average global temperature. However, the two terms tend nowadays to be used interchangeably. For a discussion see http://www.skepticalscience.com/climate-change-global-warming.htm.


18 See Weintrobe (2012) for a discussion of how people came to realise after the failed Copenhagen climate summit that governments did not care about them at the level of their survival. It was traumatic to feel this uncared for.


20 Hanna Segal has distinguished between ‘as if’ and ‘what if’ thinking. The latter seeks to test a phantasy against reality, by asking what if the phantasy were true. The former ignores reality and proceeds as if the phantasy were true.

21 Argued by Hoggett (2012).

22 Pope Francis’s basic argument in his recent encyclical on climate change is that we need to care.

23 “We are the first generation to feel the impact of climate change and the last generation that can do something about it.” Obama Guardian 4.7.15. But Obama does not appear to have embraced the New Imagination. At the same time as saying this, he gave Shell Oil the go ahead to drill for oil in the Arctic. The danger is this is the ‘as if’ disavowing imagination.
Session 1

Strategies for Community Resilience
ABSTRACT Climate change is exacerbating natural disasters, and extreme weather events increase with intensity and frequency. This requires a more in-depth evaluation of regional climates and locations, where natural hazards, vulnerabilities, and potential impacts will vary. At the community level, private residences are crucial shelter systems to protect against disasters, and are a central component in the greater effort of creating comprehensive disaster resilient built environments. In light of recent disasters such as Superstorm Sandy, there is an increased awareness that residential buildings and communities need to become more resilient for the changing climates they are located in, or will face devastating consequences. There is a great potential for specific high-performance building technologies to play a vital role in achieving disaster resilience on a local scale. The application of these technologies can not only provide immediate protection and reduced risk for buildings and its occupants, but can additionally alleviate disaster recovery stressors to critical infrastructure and livelihoods by absorbing, adapting, and rapidly recovering from extreme weather events, all while simultaneously promoting sustainable building development. However, few have evaluated the link between residential high-performance building technologies and natural disaster resilience in regard to identifying and prioritizing viable technologies to assist decision-makers with effective implementation. This paper presents the research objective and methodology to create a process of effectively prioritizing residential building technologies that encompass both high-performance and resilience qualities that can be implemented for a variety of contexts at an individual, or combined community level. Interdisciplinary variables critical to prioritizing natural disaster risks must be identified and evaluated. Additionally, attributes for resilience and high-performance have to be defined and quantified for judicious selection of high-performance resilient building technologies that can provide solutions for the identified risks. Decision-makers can utilize the completed process to evaluate building natural disaster risks and communicate strategies to improve building performance and resilience efficiently.

KEYWORDS: Disaster resilience; residential buildings; high-performance building; climate change.

Introduction

Over the past 100 years, research has shown that the surface temperature on Earth has risen by more than 0.8°C (1.4°F) with much of that increase having taken place over the last 35 years (National Research Council, 2012). This increase will, and in some cases has already led to various changes in the environment, which will continue to exacerbate the
intensity and frequency of extreme weather events and subsequent impacts on the built environment within the United States (National Research Council, 2012). This outlook holds true for other developed and underdeveloped locations across the world facing similar circumstances and high risk to climate change and extreme weather. Nations such as the Philippines that was struck by Typhoon Haiyan in 2013, and European countries devastated by the 2003 heat waves are examples of vulnerability and tragic losses to extreme weather that has been occurring. Between 1994 and 2013, over 15,000 extreme weather events around the world directly resulted in over 530,000 deaths and economic losses totaling USD 2.17 trillion (Kreft et al., 2015). Climate change is our reality, and it has become increasingly important to become more aware of the many implications it will have on our lives, our buildings, and our infrastructures. Disaster resilience, as an integrated approach across the various construction domains and practices addressing the different performance mandates, ranging from structural to thermal, moisture, visual, and environmental performance will be necessary to overcome the changes we will inevitably face. At the local level, private residences can be viewed as crucial systems to protect and provide shelter against extreme events, and become a pivotal part towards the greater effort of creating comprehensive disaster resilient built environments.

Many definitions and interpretations of resilience exist across multiple disciplines making it a difficult concept to quantify, evaluate, and gain clarity for what it means and how it applies to different industries (Hassler and Kohler, 2014). According to the U.S. Department of Homeland Security (DHS) (2015), resilience can be defined as: “the ability to prepare for and adapt to changing conditions, and withstand and recover rapidly from disruptions.” In a review of several definitions of resilience used by multiple disciplines, three key principles and three verbs were derived that represent resilience holistically (Patterson et al., 2013. These principles are to reduce risk, decrease recovery time, and foster adaptation, while the key verbs are to absorb, adapt and recover. There is a great potential for specific high-performance building technologies (technologies with energy efficient and other enhanced systems performance qualities) to play a vital role in creating resilience to natural disasters for individual buildings, or through their application on a community or neighborhood scale to alleviate disaster recovery stressors to critical infrastructure and livelihoods. For example, compared to conventional residential enclosure systems, a high-performance building enclosure such as it can be found in a PassivHaus, can provide long-lasting shelter against dangerous rapid temperature drops due to power outages, which could otherwise force occupants from their homes (Leigh et al., 2014). Similarly, co-generation systems incorporated into a community to produce and store combined heat and power for neighborhoods could offset the power demand and disaster threat levels by acting as a buffer, and allowing for self-sufficiency in the event of utility failure and/or disconnect. A
prevalence of high-performance enclosure systems in this scenario could reduce the overall power demand for a community that generates energy; energy that could then be utilized for priority based distribution on a local neighborhood scale, while simultaneously working to alleviate power recovery stressors and expenditure on a larger city, county, or regional level. Nevertheless, while viable high-performance building technologies exist that can simultaneously provide disaster resilience, not every high-performance technology automatically supports disaster resilience, and may specifically reduce resilience in some aspects, depending on the type of impact. What is currently not well known and requires further study, is a broader evaluation of desired results and impacts that can be expected, as well as their applicability in diverse locations for a variety of disasters. This is especially true when considering the interactions and relationships between differing climates, vulnerabilities, communities, and technologies.

A review of background literature has revealed a promising connection that exists between high-performance building technologies, disaster resilience, and climate change adaptation. Sustainable building practices by way of reducing negative environmental impacts (e.g. fossil fuel use and greenhouse gas emissions), economic impacts (e.g. energy consumption), and social impacts (e.g. safety and security) were also found to be links in this research domain. However, the highly interdisciplinary field of resilience remains a challenge and reveals a research domain filled with unknowns as a result of existing gaps in knowledge, gaps in research, and effective application of strategies. The following section outlines the challenges that have been identified in our investigation, and then discusses the required steps and tasks to enhance the integration of design strategies around high-performance buildings, disaster resilience, and climate change adaptation as the overarching goal.

**Natural Disaster Resilience through High-Performance Buildings**

Different climates around the world can induce various types of naturally occurring hazards, commonly referred to as extreme weather events. When these events cause catastrophic damage and loss of life, they become classified as natural disasters. The devastation that can occur to the built environment as a result of natural disasters has become all too familiar, and is an unfortunate and mostly uncontrollable product of our Earth’s nature. In recent years, climate induced natural disasters, which includes hazards such as hurricanes, droughts, and extreme temperatures have risen in frequency and intensity, and consequently, so have the detrimental impacts of the aftermath associated with these events.
Some initial research indicates that unsustainable development by building in locations vulnerable to natural hazards and giving minimal regard to future environmental, economic, and social impacts, is the root cause for increasing costs and devastation from natural disasters (Federal Emergency Management Agency, 2000). Increasing resilience to disasters by reducing risks and absorbing, adapting, and rapidly recovering from a natural disaster event can be done so through enhancing environmental, economic, and social aspects of communities, and thus making them more sustainable in the process (Federal Emergency Management Agency, 2000; Mileti, 1999). This is an approach that can be achieved through high-performance buildings, which can mitigate natural disaster risks by absorbing hazard impacts and reducing recovery time, while also using resources more responsibly and efficiently. The notion of using high-performance buildings as a way to adapt to climate change through resilience, and as a result also contribute to sustainability, is a popular topic of discussion (Asprone et al., 2014; Cutter, 2013; Hassler and Kohler, 2014). Though some strides have been made and achieved some progress regarding this issue, few have investigated the individual utilized technologies comprised of this connection, and there is a growing need for more research in this area.

*Past Research Efforts Integrating High-Performance Buildings and Resilience*

In a recent study, an attempt was made to examine future, regional level climate change impacts throughout the U.S., and identify green building and sustainability strategies and LEED credits that have the potential to provide resilience to the risks identified by the various impacts (Larsen et al., 2011). This study can serve as an initial guide and basis for builders to begin thinking about sustainability and green building strategies that can achieve disaster resilience specific to a project locations region. However, this is a first step, and there is still much more research required to strengthen the decision-making process in this area. The research gaps identified by the authors include the fact that the broad generalized categorization of the utilized climate data requires downscaling to the local level to better understand direct impacts on neighbourhoods and buildings. Additionally, while the before mentioned study was able to rank basic sustainability strategies for resilience as they apply to the broad eight U.S. climate regions by giving high, low, or N/A priority classifications, this analysis remains coarse and vague in providing explicit details and performance metrics for informing decision makers in selections due to the method and scale used.

There are examples of high-performance building technologies that have been implemented successfully in order to provide resilience to natural disasters, such as the exemplary demonstration of integrating high-performance, resilience, and climate for the Schiestlhaus, a PassivHaus standard building in an alpine climate located on the Hochschwab Mountain in Austria. This facility was built to withstand extreme low
temperatures, provide shelter and refuge to hikers and climbers, and essentially operate year round off the grid. In Boston, Massachusetts, the LEED Gold certified Spaulding Rehabilitation Hospital implemented high-performance building technologies in response to prior flood devastation caused by Superstorm Sandy and the potential for the building’s location to see a rise in sea level in the future. All critical mechanical and electrical systems required for the hospital to remain operational in the event of a flood were placed on the penthouse floor. In addition to this, a dedicated cogeneration plant produces power and generates heat for hot water and heating loads, and due to its independent capabilities from the grid, allows the facility to maintain functionality should there be regional power outages. This provides robustness to the building systems in place, and thus increases facility and community resilience.

It is important to mention that an understanding for the potential risks that could impede the results of high-performance building technologies on resilience and other aspects of building performance should not be overlooked. A report released by the Federal Emergency Management Agency (FEMA) provided some insight into the various interactions between green/high-performance technologies and buildings that may require caution when implementing common green building practices to achieve resilience from natural disasters (Gromala et al., 2010). Green building ratings, such as LEED for Homes, were evaluated for their positive or negative interactions with a building structure in order to identify areas that could compromise a building’s resistance to a natural disaster. For example, PV cells placed on a building in a location with large solar gain potentials may be a very good solution to generate energy during grid wide power outages due to overload (e.g. heat waves). Yet, if this location were also subject to harsh weather-related events such as intense hail and windstorms that could severely damage the system, this solution would not be a practical system alone in terms of achieving resilience. Interactions such as this are important to explore and assess for effective decision-making and implementation of high-performance building and disaster resilience for specific locations. The inclusion of such interaction assessments is an important factor that should be included in green building standards and decision-making tools to aid in climate change adaptation.

Furthermore, the DHS has been developing a performance-based tool to aid in the construction of high-performance buildings, which takes into account resilience to multi-hazards (National Institute of Building Sciences, 2011). The tool allows for building owners to identify and set performance targets based on the attributes of high-performance defined in the 2007 Energy Independence and Security Act for high-performance building. However, this tool does not identify prescriptive or other tangible technologies to achieve the levels of performance desired by the owner using this model. This additional but most critical task is
left to the design team to identify and decide which technologies to use that will ultimately achieve the desired results.

Research Needs Towards Creating Disaster Resilient Communities

While we have found concerted research efforts and discussions linking the domains of high-performance buildings, resilience, and climate adaptation, there are still gaps in these efforts, which present an opportunity for further investigation. First, there is the area of re-discovering and re-evaluating local level building characteristics, which historically have encompassed resilience practices, and integrating these characteristics with market area and demographic data, as well as climate model data to identify natural hazards and vulnerabilities that may exist for communities and locations in immediate need. Secondly, there is a lack of consensus regarding resilience definitions that exist for the residential high-performance building sector, as well as classifications of the attributes of performance related to them. This creates significant challenges when comparing and prioritizing high-performance technologies and communicating research outcomes to stakeholders. Thirdly, resilience research in response to natural hazards such as seismic activity has historically garnered the most attention, and consequently has made significant progress in terms of defining resilience metrics. Integrated resilience practices in response to “climate induced” natural hazards such as extreme heat and cold, or blizzards, and intense winds from hurricanes are missing in these efforts. Similarly, the focus has also been directed more so towards infrastructure and large buildings such as hospitals, overlooking the significant economic and social impacts on residential buildings. Fourth and lastly, according to our literature review, a decision-making process of judiciously selecting residential construction technologies that incorporate qualities of both high-performance building and disaster resilience for climate induced natural disasters and vulnerabilities at the local scale could not be identified. Our proposed research attempts to address and fill the above-identified gaps.

Developing a Risk and Technology Prioritization Process for Decision-Making

Our research investigates the question of how high-performance building technologies can effectively provide residential buildings resilience towards local level climate induced natural disaster risks that are currently experienced and can be further anticipated throughout diverse climate regions. To answer this question, we will develop a process to prioritize applicable high-performance residential building technologies for homes and communities, which can consider immediate and future local climate impacts, local building and community factors, and performance and disaster resilient capabilities of existing technologies for a variety of context specific decisions. In developing this process, climate-
induced natural disaster risks, their respective hazards, impacts, and vulnerabilities in regards to residential buildings, as well as the high performance resilient building (HPRB) technologies that can be implemented as solutions need to be identified, evaluated, and ultimately categorized for the next level of impact modelling and decision-making. Fig. 1 provides an overview of the important facets of this research that need to be integrated to identify and evaluate an inventory of “HPRB Technologies”.

Fig. 1. Qualities of HPRB technologies.

Identifying and Evaluating Risks and Technologies

In our research we analyse a multitude of variables that contribute to high-performance technologies at one side and resilience at the building scale on the other. Subsequently we can use this approach to expand and improve resilience at the community scale. To develop these evaluation methods we first identify immediate and future climate-induced natural disaster hazards for differing locations, and then categorize and inventory specific high-performance building technologies (i.e. HPRB technologies) that can provide effective disaster resilience to the hazards and the risks posed by the respective impacts. Failure mode, effects, and criticality analyses (FMECA) as well as fault tree analyses (FTA) are conducted to reveal relationships between HPRB technologies and climate induced natural disaster risks. FMECAs identify the impacts that result from various hazards, as well as the potential effects and levels of criticality they can impart on various building systems. Extensive case reviews of prior natural disaster occurrences and impacts to residential buildings will be used to compile detailed accounts to develop metrics for prioritizing the data. The top down approach of FTAs in contrast to FMECAs bottom up method analyses the identified impacts until chains of potential causes and contributing vulnerabilities are
traced to the source. It is there that HPRB technologies can then be assigned to address the tree of vulnerabilities and impacts identified. And where technologies do not exist as countermeasures, this process additionally reveals research and development needs for new HPRB technologies.

Fig. 2. Natural disaster housing vulnerability indicators.

All attributes for variables in the above discussed domains must then be defined and given numeric values and weights so that they can be included as metrics for quantification and prioritization of technology performance and resilience, as well as hazard impacts and vulnerabilities. Each attribute can then be used for multi-criteria decision making (MCDM), assessing applicable measures of context specific decisions with the goal of efficiently increasing resilience as well as building performance. For example, while assessing the vulnerability of a building to natural hazards can be primarily related to the type, quality, and operation of various building systems, vulnerability can also stem from many other interdisciplinary variables not directly associated with the building. As listed in Fig. 2, this includes proposed variables that must be assessed to localize the decision space, e.g. individuals or communities burdened with poverty, or barriers impeding the availability of various resources.

The stakeholders we envision to utilize and embrace this design and decision-making process includes designers, building auditors, retrofitters, surveyors, but also facility managers and disaster mitigation officials who may want to assess entire building portfolios towards their performance level in regards to natural disaster risk. We believe that these are the professionals that can profit from such an approach most and utilize it as a tool to evaluate residential buildings and communicate strategies to homeowners, government agencies, homebuilders, and community planners to educate them on how to improve building performance and resilience most efficiently for their particular situations.
Conclusion

While this research is currently targeted to the residential building scale, future research efforts can expand the scale to communities or commercial buildings by evaluating the effects of high-performance buildings as interconnected systems used for increasing disaster resilience. An expansion to larger system links within such a panarchy will analyse how building systems influence resilience across multiple scales (Walker and Salt 2006).

References


ABSTRACT In the time of global recession words like “reorganize” and “minimize” are now keywords for urban human landscape design. In Europe and in the world the main debate deals with: regeneration, consumption, reconversion, aggregation, accessibility, sustainable growth and restoration. In a question: How can we build resilience? not only for single buildings and objects but also for entire territory-systems such as for example the rural areas.

The crisis in rural areas is essentially a planetary problem: depopulation and ageing of the population, abandonment and decay of small town centres, difficulty in keeping existing businesses, exhaustive agricultural practices to the detriment of biodiversity, pollution, a lack of infrastructures and services for tourism, as well as a shortage of job opportunities for the population, etc.

The research addresses the specific cultural and productive features in the European areas in which this phenomenon it is processed and has reached significant levels of deprived neighbourhoods. Thanks to the analyses of a huge collection of projects and data, the authors have been able to define the core of the research framework, which is called Rural Architectural Intensification, setting out four broad categories of intervention for the rural landscape. RAI Strategies represent a metric for projects evaluation, a set of indicators to measure sustainable intensification to create rural resilience.

KEYWORDS: Rural resilience; evaluation process; intensification as a strategy; resilience actions.

Introduction
The current climatic contingencies and environmental emergencies require us to reflect deeply on the landscape development. Thus, even architecture and territorial planning are called upon to re-evaluate their role and their tools, thus the regeneration of rural territory and aiming to create environments that are more orientated toward self-sufficiency, which have lower environmental impacts, and can produce part of the resources that they consume. In this scenario, the countryside returns to the centre of the debate on the ecological and sustainable boost, in the wake of the crises in Western countries and in the wake of the numerous environmental catastrophes perceived as imminent and from effects that are beyond our control. “The future is in the countryside, in small towns with a human dimension. It matters little that they are physically apart from each other” (Bucci, 2012) the interactions between the two entities, already today not completely separable, are destined to intensify.
Resilience regeneration

According to Richard Sennett (2013), if you want to design an open city you need to create ambiguous edges between different parts of the city, generating incomplete forms in buildings, and planning for unresolved narratives of development.

The word resilience, invoked as a universal remedy in the recent economic crises and interpreted in sociology as the art of mediation in conflicts and thus as social resilience in situations characterized by difficult challenges, is now held in high regard in the field of architecture, city planning and landscape design too, having become one of the prime objectives in operations carried out following dramatic natural events, in particular those produced by the action of water. (Nicolin, 2015)

Resilience and sustainability require the ability to persist, to adapt and to maintain a dynamic stability in chaotic environments, given that it is becoming increasingly necessary to cope with calamities linked to the action of natural forces and to action with the main task of architecture and urban design with actions linked to the revitalization of the rural and the difficult edges of our territory. So the challenge for new strategies will be to develop those characteristics of “strategic suppleness” that are able to combine a fluidity of approach with the setting of aims and values, in the knowledge that many of the aspects of resilience are linked to a specific context. (Nicolin, 2015)

Methodology

The aim of this study is to identify a sort of indicators to measure intensification outcomes, which can be assessed in a qualitative and quantitative way for resilient rural regeneration. In this Paper we introduce how we built a metric for measuring the sustainability of architectural design actions. The methodology is built on the groundwork laid in previous research by the authors called Rural Architectural Intensification (Cattaneo, De Lotto, 2014) through the semantic analysis of a wide range of literature and documents (e.g. the priorities issued by EU on urbanisation matter). With the method of semantic analysis it is possible to analyse a large typology of sources (texts, video, interviews, photos, sounds) and uncover relationships between a set of documents and the terms they contain by producing a set of concepts related to the documents and terms (M. De Alba 2012). The methodology used to achieve that objective is a combination of two complementary and well known software tools, such as, for example: Atlas.ti, a tool used to carry out a semantic analysis of several documents.

Rural Architectural Intensification: definition of the Design Strategies and Architectural Goals

The Strategies and Goals set out below have been identified through the semantic analysis of a wide range of literature and documents and in particular through the analysis of the
priorities issued by European Community for the rural development for the years 2007-2013 and the new framework recently published for the years 2014-2020. The EU strategic guidelines aim at the integration of major policy priorities and for each set of priorities, illustrative key actions are presented as follow:

1. Improving the competitiveness of the agricultural and forestry sector.
2. Improving the environment and the countryside.
3. Improving the quality of life in rural areas and encouraging diversification of the rural economy.
4. Building local capacity for employment and diversification.

Fig. 1. RAI strategies and goals.

Thanks to the synthesis operated on all the documents analyzed, the authors have been able to define the core of the research framework setting out four broad categories of intervention for the rural landscape. Then, for each category we have defined several Design
Strategies, and for each strategy have been possible to identify Architectural Goals which might represent the design actions.

The Design Strategies have been outlined as plan of actions or directions designed to achieve a major or overall aim. In other words, Rural Architectural Intensification (RAI) Strategies represent a method (or a plan) chosen to bring about a desired future on a certain territory, such as achievement of a goal or solution to a problem or to give value at the resources of that territory.

The Architectural Goals have been described in consequence of the aims or desired results planned through the Strategies framework. In other words, the goals represent the intensification of an activity or a plan set out for a certain territory.

As a first statement of this research phase we can affirm that RAI's Strategies and Goals represent a metrics for program evaluation; a sort of indicators that attempt to “measure” intensification's outcomes. The four categories of intervention for the rural landscape are detailed represented in the Figure 1.

*The Rural Architectural Intensification Matrix*

The output of this analysis is the construction of a RAI Matrix, which the main structure derives from the Categories, Strategies and Goals.

The RAI Matrix it is divided in four main columns, which are representing the four categories. Each columns of each category is divided in sub-columns, which are the Strategies and which refer to the Goals. All the data have been collected in Indexed Database, which is useful to fulfil easily the single project features. Hence, the final phase of the research is represented by a Best Practice Report (which is composed by the RAI Matrix and description of 140 cases study and more then 500 data sheets) and by a website, http://www.raintensification.com (designed by authors), which illustrates partial results of the bibliographic research. The output is a collection of semantically indexed datasheets that represent built projects that apply the theme of RAI concerning the four specific categories.

Through the Matrix of intensification, we analysed all the architectural cases study, which generate resilience in the territory. The overall framework has been interested in terms of quality and design’s behaviour for creates sustainable density of activities for citizens in which the natural environment and the rural-urban environment coexist harmoniously. In Figure 2 is illustrated the Matrix of 41 selected case studies within the RAI Best Practice Report earlier mentioned.
Fig. 2. The matrix of 41 selected case studies. This database contains the information for next graphics.

**Visualization and ranking of the RAI performance**

In this section is introduced the process of investigation adopted to put in relationship the case studies of rural intensification with the concept of resilience. After a series of analysis, interpretation of data and comparisons, the authors have developed some graphs (Figs. 3, 4, 5, 6) with the aim to systematize and visualize the parameters that have been most satisfy by the case studies and the parameters that are low or not satisfied.


Fig. 4. (Right) Category: Culture+tourism. Parameters satisfied: 1. Tourism and architectural heritage, 2. Tourism and environment. 4. Countryside vs sea and mountain. LLRP: 6. Tourism and infrastructure. 7. Tourism in less-favourable areas.
The results are particularly significant: indeed at this stage of the research we can state that the parameters on which the projects of rural intensification have been focused are related to the aspects concerning tourist use, heritage conservation and those concerning the bioeconomy and green energy. Effectively, in the last decades, the main architectural and urban design topics were linked with energy efficiency and with the development of existing buildings, in touristic and heritage terms.

On the opposite side, we can point out that the parameters not or low satisfied are related to infrastructure, to accessibility, to intensification in disadvantaged areas or the ones linked to environmental risk factors. These typology of parameters are deeply linked with the concept of resilience hence, the topics that we have to investigate from now forward are the ones less satisfied that could be called LLRP, Low Level Resilience Performance.

**Selected case studies**

As mentioned above, the parameters less satisfied are the ones more related to the concept of resilience. For that reason we have selected the three following case studies as strategic examples.

**Volcano quarry theatre, Montpeloux Saillant, France**

The volcanic caves are a widespread presence in this region. Those scrap landscapes can become an opportunity for the territory: with this frame of mind the open-air theatre in the Monpeloux volcano cave has been realized. This project proves how the reuse of forgot
landscape heritage can become a promoter action for the growing of tourism and for the environmental redevelopment.

Accessible Ribadero, Ribadero, Lugo, Spain

It has been developed to solve the problem of the great difference of floor level which had caused so far a strong detachment between the areas of marina and city. Through a soft infrastructure, which well integrates with the surrounding, the aim of the project is to bring accessibility to these places and to allow their full use also to the weaker sections of population. This small-scale intervention regenerates the context and revitalizes the touristic attractiveness.

Vineyard landscape, Oltrepò Pavese, Italy

Developed by Universities, associations and citizens to control the devastating
phenomenon of land precariousness and to identify the connections between instability and cultivation practice. Typologies of vineyard able to combine identity, landscape and stability, have been proposed. Low-impact farming practices restore a natural damaged environment and protect the quality of soil by counteracting the phenomena of hydrogeology instability.

![Fig. 9. Guidelines for new typology of vineyard cultivation against hydrogeological instability, 2009.](image)

Conclusions and discussion

Even though the research is still in progress we can define what may be the strategies of sustainable intensification that create resilience in certain European rural contexts.

The strategies are: consolidation of the landscape, renewal of leftover landscape, accessibility and space connections. These concepts are already well known, however they acquire new significance and impetus if juxtaposed to the concept of resilience. Pending further developments of the research we can identify the priorities and illustrative key action on which to focus for give a future to the forgotten rural areas:

- **Urban infrastructure and connections with slow and fast mobility:** Upgrade infrastructure and connections with slow and fast mobility paying attention to the impact on the aesthetic perception and the environmental impact;

- **Regeneration of environment for recreational and sports activities:** Take advantage of the special environmental conditions for tourist leisure, sports, cultural and educational activities; seek maximum adaptation to the needs of the environment with minimal impact;

- **Seismic safety:** building systems and materials that ensure seismic safety;

- **Environmental regeneration areas:** Biodiversity conservation areas; Refuge areas for wildlife; Areas of connection between different habitats, ecological corridors; Filter areas against potential polluting elements; Barrier areas against wind and water erosion;

- **Re-naturalisation interventions:** Intensifying renaturalisation interventions of agricultural, uncultivated and infested land, spaces resulting at the edge of construction sites, abandoned
quarries, production areas by developing: forests, parks, also agricultural;

- *Agriculture and tourism*: Improve the quality and the economic value of forests and valuable crops (olive groves, vineyards, etc.) by means of interventions simultaneously compatible with development: tourism, commercial, industrial;

- *Preventive measures against natural hazards*: Restore natural environments damaged by disaster and take appropriate preventive measures against natural hazards: hydrogeological instability, landslides, mudslides, volcanic flows, pest infestations, diseases, etc.

**References**


Study on Sustainable Reconstruction

After an Earthquake:

A case study of the Ludian reconstruction project

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ABSTRACT
Ludian County (Yunnan province, China) suffered a shallow earthquake with a moment magnitude of 6.1 on 3 August 2014. The earthquake killed at least 617 people and injured at least 2400 others. Over 12,000 houses collapsed and 30,000 were damaged. The villagers were worried about their traditional rammed-earth buildings, 90% of which were destroyed during this earthquake. Given the increase in reconstruction needs and the poor traffic conditions that had resulted after the earthquake, the price of building materials rapidly increased and exceeded the acceptable budget limit for most local villagers. For them, brick-concrete structures are earthquake-resistant. Thus, the villagers wanted to build brick-concrete structures instead of traditional rammed-earth buildings during the reconstruction period. However, transporting large amounts of disused earth is difficult.

Taking the situation in Ludian as an example, our research team decided to use the “local technology, local materials, and local labour (3L)” strategies to participate in the reconstruction project. The traditional rammed-earth technology was improved by using the “high science and low technology” theory, which mainly focuses on the seismic capacity, thermal comfort, and cost of construction. We supported a family to build a rammed-earth building according to the “3L” strategy. This demonstration project fully respected the traditional cultures and the autonomy of villagers and also made rational use of local materials and local technology to rebuild the rural communities. The concept of “collaborative construction” not only provided an opportunity for the local labour force to learn new skills but also reduced the economic pressure on house construction. The demonstration project considered the reduction of environmental and ecological damage in the entire process. It will also provide a reference for the local government to make rules for the reconstruction project.

KEYWORDS: Sustainable reconstruction, earthquake, local technology, local materials, local labour.

Introduction
Ludian County is located between 568 and 3356m above sea level in Zhaotong Prefecture, Northeast Yunnan. Its total area is 1519 square kilometres, of which 87.9% is characterized by mountains and valleys. Such terrain makes transportation inconvenient and impedes the development of the area. Ludian has a low latitude upland monsoon climate. No significant temperature difference exists among the four seasons. The annual average
The temperature is 12.1 °C, and the annual average rainfall is 923.5 mm. The 2014 Ludian earthquake with a moment magnitude of 6.1 struck Ludian County, and with a focal depth of 12 km on 3 August 2014. The earthquake claimed 617 lives. A total of 112 people were reported missing, and a lot of people were injured. Over 80,900 houses collapsed and 129,100 were severely damaged (2014 Ludian earthquake, 2014). After the earthquake, the challenges of reconstruction work include:

- bad anti-seismic performance of traditional rammed-earth buildings
- significant increase in the price of construction materials
- how to deal with the construction waste of damaged buildings in earthquake
- poor thermal performance of brick-concrete buildings
- lack of local labour

The villagers have lost confidence in the performance of traditional rammed-earth buildings. They are now eager to have their houses that are anti-seismic, cheap, and comfortable. In collaboration with Professor Emily So of Cambridge University and Professor Bai of Kunming University of Science and Technology, our team launched a Village Rebuilding Assistance Programme in Guangming Village since October. We aim to use the “local technology, local materials and local labour (3L)” strategy to design an anti-seismic building with traditional features at low cost but enhanced and comfortable living environment. In addition to rebuilding, we also hope to provide a basis for the local government to formulate reconstruction strategies.

The progress of reconstruction project

Before the initiation of the design work, the team conducted a series of survey and investigation in the village to find an appropriate solution. We then chose a family for the first demonstration building in Guangming village. The owner is a woman with two children and their living condition was poor. She must work hard to support her daughter's study in the university. Mrs Yang agreed with our reconstruction concept and also gave us her suggestions about the building design. Finally, we designed a main house with rammed-earth and a kitchen with adobe brick (Fig. 1 and 2). The project started in November 2014.

Construction Preparation and Foundation Construction

Before construction, the villagers should spend half a month to sieve the soil of the damaged building and make it moist in the site. At the same time, two adobe bricks of the kitchen were constructed during this period. These adobe bricks must be maintained for 20 days so that their performance will be optimized. The foundation of the main house and the kitchen was a C15 rubble concrete structure with a cement: sand: stone: water proportion of
This structure was similar with the brick-concrete building in the village so that the villagers can build it by themselves.

Main Structure Construction

After 5 to 7 days of maintaining the foundation, we started to construct the main house. Steel bars inside the wall became an important part of an effective anti-seismic design because it connected the foundation and enhanced the integrity of the houses. We changed the components of the wall (soil: sand: cement: grass: fibre proportion of 100:100:7:0.2:0.2) to make the wall more stable (Norton, 2001). The using of local materials have solved the construction waste problems of damaged buildings in earthquake. Some concrete belts were added into the wall to improve structural integrity and to avoid vertical cracking. In this project, we used electrical rammed tools which were improved according to local manual technology to promote efficiency (Fig. 5). Several kinds of rammed head were provided to fit
the different parts of the wall. According to the height of formwork, the villagers needed to ram the wall six times for every floor (Fig. 6-8).

After the rammed-earth work, we spent four days to build the C20 cast-in-place concrete floor (Fig. 9). Given that the weather was not cold during these days, the villagers can easily finish the work. During the construction of the second floor, we encountered some difficulties in terms of operating efficiency. The villagers must pay attention on construction safety because the platform was high and the building materials were not easy to transport (Fig. 10 and 11). Thus, these concerns must be addressed. The construction of the main house was completed in January 2015. In the following half month, we finished constructing the kitchen before Chinese New Year of 2015 (Fig. 12).

![Fig. 5-12. Main structure construction.](image)

**Shaking Table Test**

To verify the improved technology that we used in the reconstruction project, a shaking table test on a single-layered rammed-earth house pilot project was conducted in Kunming (Fig. 13). The EL-Centro earthquake and the Ludian earthquake were used to simulate the conditions in the test. The sequence of the shaking table test included two selected earthquake acceleration records with peak values at 0.1, 0.22, 0.4, and 0.62g. After the test, only several small cracks could be observed on the rammed-earth wall (Fig. 14) (YNEERI, 2015). The results indicate that the anti-seismic performance of the improved technology is better than that of the traditional one. Based on the analysis of test results, several improvements can still be done.
Performance Evaluation

Cost Analysis

We chose a brick-concrete building with the same area near our demonstration building in Guangming village to compare the cost in terms of three aspects: total cost, material cost, and labour cost. The details are shown as follows (Fig. 15):

As see in the chart, the average cost per square meter of the rammed-earth building is less 34% than that of the brick-concrete building, thereby indicating the cost advantage of the rammed-earth building. However, the material cost of the rammed-earth building is only half of that of the brick-concrete building and the labour cost is 1.4 times. Thus, the cost can still be reduced by optimizing manpower during the construction. In the following project, we should improve the technology in terms of two aspects:

1) Reduce the manpower cost by improving the technology to enhance the construction efficiency as well as by encouraging collaborative construction among villagers.
2) Reduce the material cost. Based on the reports of shaking table test, the proportion of cement and steel bars can still be further reduced.

**Materials Cost Analysis**

As seen in the chart (Fig. 16), the proportions of cement, steel bar, sand, colored steel tile, and metallic tile constitute the largest amount in terms of total cost. Specifically, the metallic tile and colored steel tile of roof materials account for 25.6% of the total cost. Thus, looking for cheap alternatives for these components can reduce the construction cost. The cement bricks of partition wall in stairwell will also be replaced by rammed-earth wall when the technical problems are solved in the following project.

**Manpower and Time Need Analysis**

The brick-concrete building with the same area was also compared with the demonstration rammed-earth building in terms of manpower and time needed to finish. The details are shown as follow:

![Fig. 17. Manpower analysis](image1)

![Fig. 18. Time need analysis](image2)

From the two charts (Fig. 17 and 18), the foundation of the two buildings is almost the same. However, a significant difference was observed in terms of manpower and time needed between first and second floor constructions, and this difference is also reflected in the project cost. The slope roof of the rammed-earth building is more complicated in terms of
structure and construction technology than the flat roof of brick-concrete building. Thus, the manpower and time it took to finish the former were higher compared to those of the latter. In terms of construction preparation, sieving and ensuring the moisture of the soil in rammed-earth buildings took a little more time but did not need a lot of manpower. Preparing and transporting the brick and steel bar in brick-concrete buildings requires a lot of effort but only needs a short amount of time. Thus, the manpower and time needed to finish the brick-concrete buildings can be reduced by optimizing the design and the choice of rammed tools during the construction.

**Summary**

Therefore, from the previous analysis, we will improve the design and technology by the following aspects:

1). Construction tools and technology: To improve the efficiency of the rammed tools and formwork. The durability of the rammed tool head is also an important issue so that the construction can proceed smoothly. The improvement of the formwork will be considered in terms of its being lightweight, its good impact resistance, and ease in assembly (Taylor, & Luther, 2004).

2). Building materials ratio: Based on the results of shaking table test, we can reduce the usage of cement, or an alternative (for example lime) will be used to reduce the project cost. Treated local bamboo can also be considered to replace the steel bars in walls.

3). Building design: To study and optimize the form of the foundation, floorslab, and roof with rammed-earth buildings to save cost and time needed to finish the buildings to improve their anti-seismic performance. New technology and building materials should be considered into the system which respect the traditional cultures.

4). Manpower: After improving the above aspects, the “collaborative construction” concept should be promoted in rural villages. It can increase the enthusiasm of villagers and also reduce the cost by promoting exchange labour instead of hired labour.

**Further study**

Because this is the first demonstration building of the reconstruction project, there is still enough room for improvement. In particular, we want to build Guangming village as an overall reconstruction project of a community and its supporting facilities (i.e., construction of village centre, setting up ecological toilets, and promoting public health awareness) will be built which can achieve good social effects (Wan et al., 2011). The reduction of environmental and ecological damage, embodied energy of the entire process and thermal
comfort will also be calculated in next steps. From the above analysis, those ideal performance can be achieved in the following buildings and community constructions.

**Conclusion**

However the Ludian case study show that local materials and local technology should be made rational use of in the reconstruction project, especially in such kinds of poor rural areas. The project fully respected the traditional cultures and the autonomy of local villagers which means the core of local community development. The concept “collaborative construction” not only provided an opportunity for the local labour force to learn new skills but also reduced the economic pressure on house construction (Chi & Ng, 2014).

The “local technology, local materials, and local labour (3L)” strategies emphasizes the concept of sustainability and focuses on the importance of local humans living in poor rural areas. The strategy suggests a self-sufficient, regional characteristics-based model that is suitable to the reconstruction situation of poor rural areas, which have poor transportation and backward economy. It can also reduce the communities’ dependence on external assistance by emphasizing the use of local resource and traditional core values. The discussed 3L strategies could provide a systemic way to further study sustainable reconstruction and community renewal in such kinds of poor rural areas.

**References**


Session 2

Co-Housing
ABSTRACT This paper explores how we can (and in many places already do) build more inclusive eco-housing. This requires understanding the interweaving pressures that push up the price of housing per se, from capitalist processes, state/government processes, to social processes. It also requires identifying those costs that are excluded from current calculations, such as the unaccounted environmental impacts of housing, and lifetime and maintenance costs. Inclusive and affordable eco-housing is about basic rights to secure, safe, healthy and cheap to run shelter. Affordable eco-housing is an outcome of social justice. There are identifiable changes that can be made to existing ways in which housing is financially valued, building is permitted, and houses financed.

Using examples from fieldwork of over thirty case studies of eco-housing in Britain, Spain, Thailand, and the USA, and data collected through interviews participation and photography, the possibilities of inclusive housing are examined. The current ways in which housing is ‘costed’ is limited and limiting, and the processes of why and how we build houses creates unaffordable housing.

New economic models are being developed and tested, community and communal approaches to eco-housing have been trialled and new models of living and designing tried. There are many examples of affordable eco-housing which are diverse, inclusive and potentially replicable. However, many of the existing examples of affordable eco-housing rely upon self-labour, government initiatives, large loans or free land. This paper offers a supportive but critical analysis of the extent to which existing innovative approaches have overcome long-standing forms of exclusion and injustice. By examining a broad range of international material it is possible to argue the extent to which it is possible to build eco-homes for all.

KEYWORDS: Eco-home; inclusivity; self-build.

Introduction

I am interested in how people are providing and building eco-housing for themselves, how they make a different reality, and what economic models are created in that process. I have recently completed a project that examined a broad variety of affordable eco-housing in Britain, Thailand, Spain, Argentina and USA. I am going to draw upon just a few examples to critically examine what these different economic models for housing provision look like. While I am always full of hope that we can build a better world, I worry that we still
romanticize and celebrate alternative projects rather than get to the detail of what they are really challenging or achieving. Of all the presumptions attached to eco-housing the most pervasive, popular and oft repeated is that eco-housing costs more than conventional housing, and as such it is expensive and unaffordable. This rhetoric frames eco-housing as a luxury for the wealthy, or a choice for the environmentally committed willing to make sacrifices. This perceived cost of eco-housing is one of the biggest, if not the main, rationale used to explain its lack of uptake.

**Affordability**

Affordability is a measure of the capital (or income) of someone in relation to housing costs. In other words, whether the capital they have available will enable them to afford to purchase or rent a house. Such a definition, however, is immediately complicated by the different ways in which affordability can be calculated, what such calculations are intended to achieve, what is included, assumptions made in such calculations and different interpretations of the causes of the lack of affordability (Wilcox, 2006). Affordability of housing is calculated in a number of different ways: as the median gross income ratio to housing costs (purchase or rental) (Mulliner et al., 2013); in relation to residual income after other basic needs have been purchased, such as food and fuel (Stone, 2006); as a combination of traditional affordability ratios and residual income (Bramley, 2012); and using the Housing Affordability Index (HAI) (Gan and Hill, 2009) which calculates affordability across a range of different incomes in one region.

In Britain the government defines affordability as simply being below market rent. This approach makes no attempt to relate house prices to available incomes, or to consider residual incomes in relation to other basic needs such energy bills, food or travel. The cost of housing and its unaffordability is a pervasive and perpetual problem worldwide.

**The financial costs of building**

The financial costs of building are a result of the expense of all the elements required to build houses and the way in which houses are considered a reliable form of financial investment. The main factors are summarised in Table 1. In a contemporary house in England the two largest areas of expenditure are estimated to be materials (40%) and labour (34%). House ownership is often an attractive financial investment (Dorling, 2014). In recent years the price of housing in Britain has increased exponentially which means that homeowners benefit from house price appreciation while also having somewhere to live. The processes through which housing is understood as an investment are illustrated in Figure 1. A combination of factors leads to high land prices, which are fed into high house sale prices, combined with high demand (mainly through increased single occupancy but also uneven
growth) this creates a vicious (or virtuous if you are lucky enough to own a house) circle of ever increasing prices.

Table 1. Main factors contributing to house costs.

<table>
<thead>
<tr>
<th>Main factors contributing to house costs</th>
<th>Includes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Purchase</td>
</tr>
<tr>
<td>Planning</td>
<td>Applications, changes and appeals</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Roads, facilities, service provision (water, sewerage etc)</td>
</tr>
<tr>
<td>Professional fees</td>
<td>Architects and designers fees</td>
</tr>
<tr>
<td>Compliance fees</td>
<td>Planning and building control fees and tax on materials</td>
</tr>
<tr>
<td>Labour</td>
<td>All labour costs</td>
</tr>
<tr>
<td>Materials</td>
<td>All material costs</td>
</tr>
<tr>
<td>Market</td>
<td>The financial circle through which housing becomes an investment</td>
</tr>
<tr>
<td>Occupation</td>
<td>Includes energy running costs, state costs such as Council Tax</td>
</tr>
</tbody>
</table>

Fig. 1. Housing as an investment in England.

Definitions of eco-building

Ecological architecture calls for an understanding of the peculiarities of place, materials, cultural context, climate, solar and wind patterns, people’s lifestyles and needs, and existing biodiversity. Common functions of an eco-house are: to minimise resource use (in materials, in embodied energy, energy requirements, water use), minimise waste (in materials, space,
energy, leakage), and maximise use of renewable energy and renewable materials. Eco-
building is a diverse and contested array of approaches, designs and methods. The term 
eco-building can include zero or low carbon houses, low impact developments, sustainable 
housing, green building, passive houses, zero-net energy housing and energy-plus houses.
When discussing eco-building it is important to distinguish between the function and the 
form. The function refers to the intended outcome of a design choice, whereas the form 
refers to the process by which that function is to be achieved. Thus the forms of eco-housing 
vary enormously and include using highly-technological systems or low-tech vernacular 
natural-build approaches, to achieve the same function of low carbon housing.

**Building in affordability**

Many eco-homes have been built on small budgets. At the same time there are numerous 
examples of expensive eco-homes that remain the preserve of the wealthy. Most aimed to 
reduce land, material and labour costs, and avoid professional fees and compliance costs – 
which is far easier to do in rural than urban areas. I am going to explore in more detail two 
examples of affordable eco-housing.

*Example: Dignity Village, USA*

Dignity Village has been built and run by homeless people to provide free housing in the 
city of Portland, Oregon, USA. In 2000 a protest started in central Portland about the lack of 
resources available for the homeless; they squatted a downtown area of the city (creating a 
tent city called Camp Dignity) and negotiated access to an acre of land (Sunderland Yard, in 
the north of the city) in return for ending the protest. This access was initially only granted for 
eight months and residents have had to make the case for their continued existence while 
the space remains under threat from Portland City Council (Busse, 2003). Portland City 
Council also placed certain criteria on how the land was to be used – dividing the concreted 
plot into small sub-divisions of approximately 60 spaces between 9m² and 11m² (Sabatier, 
2006). It is classified as a transitional housing campground and must comply with State of 
Oregon campground building codes. It was intended that residents would not stay 
permanently, but rather use the village as a temporary stop gap on their way to getting 
permanent housing. Over the first five years it was estimated that 800 residents passed 
through the village. In 2012 Portland City Council determined that residents can stay for a 
maximum of two years (Slovic, 2012). The housing structures are small and built from an 
array of scrap reclaimed materials – wood, straw, adobe, metal. The City Repair Project ran 
a training session at Dignity Village to teach natural building methods and collectively built 
“five houses in ten days” (Mark Lakeman interview, 2010).
Table 2. Summary of changes made by residents of Dignity Village to main factors contributing to house construction and occupation costs.

<table>
<thead>
<tr>
<th>Main factors contributing to house costs</th>
<th>Attempted solution to reduce costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Yes</td>
</tr>
<tr>
<td>Planning</td>
<td>Yes</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Yes</td>
</tr>
<tr>
<td>Professional fees</td>
<td>Yes</td>
</tr>
<tr>
<td>Compliance fees</td>
<td>Yes</td>
</tr>
<tr>
<td>Labour</td>
<td>Yes</td>
</tr>
<tr>
<td>Materials</td>
<td>Yes</td>
</tr>
<tr>
<td>Market</td>
<td>Yes</td>
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</table>

The extent to which the homes at Dignity Village are eco-houses could be challenged. Although built of reclaimed material, few benefit from passive solar or have insulation. The straw bale structure was not being maintained and was suffering with plaster peeling away on the external walls. Although natural building skills were taught to people in the early years, the high turnover of residents means that these skills are unlikely to be passed on. There are also problems with the site in that it floods, there are fire safety concerns and without ownership there remains uncertainty about their future. The costs of housing were dramatically reduced by challenging all the factors that contribute to house costs. However, the houses produced were not robust and although the village gave homeless people much desired autonomy and freedom, they do not benefit from comfortable eco-homes. While
residents are often very happy to have a private individual space that was an infinite improvement on sleeping on the streets, as structures there is significant potential for more substantial construction. Overall, Dignity Village illustrates what is possible if people are given space and just a few resources to create their own home and their own way of living. It required the state to support and concede to homeless people’s demands but a negotiation allowed some leniency in the way in which building regulations were applied.

Example: LILAC, Leeds

The Low Impact Living Affordable Community (LILAC) in Leeds, England, was completed in 2013. Now home to 20 households it is an ecological and affordable co-housing project in an urban space. Built on an old school site purchased from the local Council in the middle of Bramley neighbourhood. LILAC has a range of houses, from four bedroom homes to studio flats. The houses are built from a novel form of prefabricated straw bale panels.

Fig. 3. Straw-bale homes at LILAC, Leeds, England (Courtesy of Craig White, White Design Associates).

LILAC developed a new home ownership model in an attempt to decomodify the housing market, to “develop an alternative based on economic equality among residents, permanent affordability, demarketization, nonspeculation and mutual co-ownership”. LILAC set up a Mutual Home Ownership Society (MHOS). The intention was to ensure the houses remained affordable in perpetuity, costs were linked to ability to pay (income) and people would not necessarily lose their homes if their circumstances changed. The land and houses are co-operatively owned by the MHOS (staffed by inhabitants of LILAC, ensuring self-governance). Minimum net income levels were set for different size houses in the project, in order to ensure that the 35% equity share rate would generate enough income for the MHOS to
cover the mortgage repayments. Thus, annual household minimums currently range from £15,000 for a one-bed flat to £49,000 for a four-bed house. In effect the higher earners subsidise those on lower incomes and yet at the same time they do not forfeit their investment and the approach is fair because all inhabitants pay the same percentage of their income.

Table 3. Summary of changes made by LILAC to main factors contributing to house construction and occupation costs.

<table>
<thead>
<tr>
<th>Main factors contributing to house costs</th>
<th>Attempted solution to reduce costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Yes</td>
</tr>
<tr>
<td>Planning</td>
<td>None</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>None</td>
</tr>
<tr>
<td>Professional fees</td>
<td>None</td>
</tr>
<tr>
<td>Compliance fees</td>
<td>None</td>
</tr>
<tr>
<td>Labour</td>
<td>None</td>
</tr>
<tr>
<td>Materials</td>
<td>Yes</td>
</tr>
<tr>
<td>Market</td>
<td>Yes</td>
</tr>
<tr>
<td>Occupation</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main factors contributing to house costs</th>
<th>Attempted solution to reduce costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Purchased from the Council in non-sought-after area of the city</td>
</tr>
<tr>
<td>Planning</td>
<td>Complied with full planning requirements</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Is connected to mains services</td>
</tr>
<tr>
<td>Professional fees</td>
<td>Hired architects White Design Associates</td>
</tr>
<tr>
<td>Compliance fees</td>
<td>Complied with all building regulations</td>
</tr>
<tr>
<td>Labour</td>
<td>Hired construction firm to build houses</td>
</tr>
<tr>
<td>Materials</td>
<td>Used straw bale prefabricated wall system</td>
</tr>
<tr>
<td>Market</td>
<td>Developed innovative Mutual Home Ownership Society model</td>
</tr>
<tr>
<td>Occupation</td>
<td>Will benefit from low energy costs because of straw bale construction and eco-design</td>
</tr>
</tbody>
</table>

Costs were also reduced in other ways, although an architect and building company were hired to design and build the homes, the land was purchased directly from the Council and by using a straw bale prefabricated wall system some costs were reduced on materials. The costs of construction were, however, not that different from other methods. A one bedroom flat of 48m² cost £84,000 to build, at a cost of £1,744 per m², while the average costs in England are £1,200 per m². Of course the difference is in the quality of the housing and the lifecycle costs that will be considerably lower for residents of LILAC than those in conventional housing. Overall, LILAC did not fundamentally challenge as many of the existing factors contributing to house costs as those in Crestone and Dignity Village did, and neither are the homes produced as cheap. However, the houses at LILAC are probably environmentally superior to the other examples, and the ownership structure is exemplary in facilitating a diverse and economically sustainable community. The LILAC model and the accessibility to those who do not wish, or cannot, self build and who want to live in a city, provides a replicable and novel approach.

Conclusions

Too often aspirations for ecologically benign futures ignore issues of cost, ownership and social equity. The costs of eco-housing are rarely fully calculated or understood. Community projects often rely on volunteers to either physically build or to financially contribute. Many
projects rely on self or volunteer labour as the main way in which to make eco-building financially viable. This, coupled with building in remote and rural locations enabled many of the case studies I have explored to exist. There is therefore a need for detailed economic analysis of how some of these alternative projects are costed and the quality of the result. I will end with ten approaches that would enable and encourage more affordable eco-housing:

1. Price houses based on construction and lifecycle costs
2. Include all labour costs in construction costs
3. Develop communal land ownership structures
4. Develop stakeholder ownership models
5. Build quality affordable eco-housing
6. Create exemption for eco-housing in planning legislation
7. Create allowable solutions for natural building in building regulations
8. Allocate land for self-build housing
9. Use different materials and methods
10. Build smaller houses with shared communal space

References


Co-Housing Developments for Resilience in Housing: Knowledge transfer to increase the number of co-housing developments

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ABSTRACT Co-housing projects think globally and act locally, they are bottom-up and non-profit, they are based on sharing and are community-oriented, they have a direct democratic structure and are self-managed and they are flexible in terms of economic- and social structure. Co-housing developments have all the characteristics to create resilience in housing. To characterise the blocking factors of co-housing developments we should talk about non-co-housing and co-housing countries such as Hungary and Switzerland.

Hungary, like many other post-socialist countries in Europe, suffers from a serious housing crisis. Bottom-up initiated co-housing projects could be a potential solution, but the development process is blocked by several factors: bad memories about “top-down housing cooperatives” forced by the socialist regime, the lack of tradition in bottom-up developments and the lack of knowledge about co-housing. How can we start the process? As one cannot change the collective memory of a whole country, the first step to realise co-housing projects is knowledge transfer - introduction and education.

Switzerland - as many other co-housing countries such as Austria, Germany and Denmark - has a more than one hundred years old co-housing history and tradition. In Switzerland, new generations can learn the rules of the co-housing from the preceding generations and the country has a well-developed co-housing network, education- and training system. Despite all these facts, only 5% of the housing stock is co-housing. How can we increase this ratio? We should promote co-housing developments even more with events, workshops and visiting tours. The goal and the tools are the same whether we talk about non-co-housing or co-housing countries. We want to move more and more people to increase the number of co-housing projects. To reach this goal we have to develop the process of knowledge transfer for every stakeholder on every platform and on every level.

KEYWORDS: Co-housing; knowledge transfer; level; platform; resilience; stakeholder.

Introduction – Co-housing developments for resilience in housing

The co-housing movement has more than a hundred years of tradition in Western European countries (Pearson, 1988; Franck and Ahrentzen, 1989). To summarize their main characteristics, co-housing developments are bottom-up initiated and self-managed housing
projects where collaboration among the residents is a key factor (Vestbro, 2010; Scotthanson and Scotthanson, 2005). As co-housing projects are initiated by the future residents, they give answers to the real housing needs of the initiators such as special spatial forms and community-oriented living, and they also help promoting goals like social responsibility, social inclusion and even new economic models. The wide variety of management structures, spatial forms and the proportion of private and shared spaces show how flexible this alternative housing form is. Living together and sharing common spaces of living requires all participants to adjust themselves to the common good. To properly maintain the physical and hygienic condition of the shared spaces the residents must agree on and set specific rules, which, if are followed, help to keep up the desired quality of the common living environment. These rules may determine a cleaning schedule, the way of waste handling, borders of outdoor and indoor footwear usage etc. It takes time and learning for each individual to adjust themselves to these rules set by common agreement, however learning new patterns of behaviour or new approaches to daily tasks will inevitably affect the residents’ lives as a whole. So they will start applying all good practices developed by the community in their private lives on a practical level in their private domains and on intellectual level in their broader social life. Someone who lives in a co-housing community where the idea of sharing, the mutual respect of co-residents, the commonly developed good practices are the building bricks of everyday life will most probably apply these attitudes towards people outside the co-housing community too and will become a great team player at work (LaFond et al, 2012; Krasny, 2008; Bush, Machinist and McQuillin, 2013; Baker, 2014). For they exclude the profit oriented housing investors and the state, co-housing developments are non-profit and independent from political decisions, which makes them more stable and sustainable than for-profit or top-down housing forms (Glatz and Komlósi, 2014). Co-housing developments ensure the four pillars of sustainability: economic, ecological, social and cultural, due to this they have a considerable impact on local scale (Tummers, 2015a).

The above mentioned characteristics altogether make co-housing developments sustainable, adaptable to new needs and able to respond to changes fast. These features make them meet the requirements of resilience. (LaFond et al, 2012).

**What are the blocking factors of the co-housing movement?**

Despite their aforementioned qualities and the increasing interest toward them, co-housing developments cannot break through particular blocking factors which hinder their spreading both on national and international levels. To characterise the blocking factors of co-housing developments we must talk about non-co-housing and co-housing countries such as Hungary and Switzerland.
After the political changes in Eastern Europe in 1989-1990 - including Hungary -, the housing system transformed from a state-controlled system to a market oriented one. The main steps of the transition were decentralisation and privatisation (Hegedüs and Tosics, 1996). Although the new political system based on democratic election, the lack of democratic traditions, both on decision-making and citizen levels, generated demagogy and distrust towards social policies including housing. The common bad memory of top-down forced cooperatives in the socialist era makes the promotion of any kind of collaborative housing almost impossible among the elderly population, decreasing the target group only to the younger generation (Glatz and Komlósi, 2014). The super high percentage - more than 85% - of home-ownerships against rents shows the huge distrust against the rental-housing sector. Home-owners in the private sector are uncertain about the economic prospect of investments like co-housing (Vestbro, 2010; Eurostat, 2014).

In non-co-housing countries like Hungary, the most important step in promoting co-housing is knowledge transfer. Providing relevant and digestible information about the unknown may generate trust and curiosity (Vestbro, 2010).

The main motives of co-housing developments in co-housing countries like Switzerland, Austria or Denmark vary from nation to nation, but in common they are based on cultural- and socio-political dissatisfaction (Glatz and Komlósi, 2014). Many of them seek possibilities for affordable and self-managed housing or are related to demographic changes (Stahel, 2006; Huber, 2008; Nena1, 2015; Kälin, 2015; Tummers, 2015a). The growing number of co-housing developments in Western-Europe shows the potential of this alternative housing form. However, this number tends to stay below a certain rate, for some reason.

Democracy has a 700-year-old tradition and bottom-up movements are a common phenomenon in Switzerland. Compared to other co-housing countries, a higher number of co-housing developments can be found there. However, this high number only reaches 5% of the whole housing stock (Glatz and Komlósi, 2014). Despite the supporting actions of the state and private investors, the number of co-housing developments is not growing further. Future residents are uncertain because of the slow planning process, the complex maintenance structure and the unorthodox financial model. These are the main blocking factors, along with the fact that the circle of initiators is limited. As they are mostly found among the educated middle class, who have the personal need and opportunity to raise their voices against unsatisfying circumstances, the circle of initiators is very narrow and this results in a limited selection of housing typology and financial models (DANACH, 2012).

To scale up the number of co-housing developments in co-housing countries, the most important step is the promotion of already implemented co-housing projects and knowledge
transfer among institutions to give answers to questionable topics like the planning process and maintenance, and to broaden the scale of housing typologies and financial models.

Methodologies of knowledge transfer to increase the number of co-housing developments

Co-housing developments should be introduced and promoted in non-co-housing countries and should be promoted and taught about in co-housing countries. As Garth Moore writes in his article “40% of your time should be spent creating content, while the remaining 60% should be spent promoting content.” (Moore, 2014) The reason why it is so difficult to reach this 60% in case of the co-housing movement is because it is bottom-up, non-profit and the individual projects and their residents do not have any interest in promoting their idea. They are happy with their homes after all. Fortunately co-housing residents are often very enthusiastic about their work and about the co-housing movement. They do a lot in favour of spreading the idea of the habitation form they are part of. The grid (see: Fig. 1) below shows every stakeholder, platform and level of a successful knowledge transfer - introduction, promotion and education - within the co-housing movement.

Fig. 1. (Glatz and Komlósi, 2015) The different levels, platforms and stakeholders.

The different groups of stakeholders consist of residents, activists, researchers, politicians and all professionals who are involved in the process on local, national and international levels.

The introduction of the co-housing phenomenon to the above mentioned stakeholder groups can be done through articles, books, lectures, radio and tv discussions and
workshops. The variety of platforms include meetings and workshops for residents and activists, events and discussions for specific stakeholder groups, online and offline articles and books, radio and tv interviews and plays. The main objective is to reach all the stakeholders and to empower them to cooperate with each other for a successful movement.

Various levels mean local - co-housing, neighbourhood, city - municipality, national and global scales. The national language is very important for local, neighbourhood and national knowledge transfer but on a global level a common language is needed (LaFond et al, 2012; Vestbro, 2010; Tummers, 2015b).

We have to realise that all the stakeholders on every level play an equally important role in creating a successful co-housing movement to increase the number of this alternative housing development and to make it a standard (Bauman, 2015).

The case of Hungary and Switzerland

The increasing number of bottom-up movements in non-co-housing countries and the increasing number of co-housing developments in co-housing countries are promising signs of a more sustainable and resilient future. Mostly in the older democratic countries with collaborative and community-oriented housing, people realise that co-housing projects bring many positive aspects into their neighbourhoods, cities and into the whole country. In newly democratized countries the emergence of bottom-up initiatives is slower and the introduction of them is more challenging but the development process has already started. What does the big picture show in the two counties brought up as examples? In which fields are they already strong and where do they need further development?

Democracy is a fairly new phenomenon in Hungary. The civil society is getting used to the fact that it can and has control of its own life and that it has strong influence on the development processes. New bottom-up movements like Critical Mass - biking in the city, Community Gardening, A Város Mindenkié and other non-governmental organisations have already started the improvement (AVM, 2015). These groups are getting stronger and they can increase the participation of the civic society, however they still cannot influence housing developments. Housing is a bigger issue; it involves more money, more power and requires a more complex- and multidisciplinary thinking.

The Community Living as a co-housing knowledge hub started this multidisciplinary work in 2014. A few enthusiastic architects launched online platforms such as a blog, a Facebook and an Issuu page, a university subject for architects was started and lectures for a wider audience were given to introduce the co-housing phenomenon in Hungary (Közösségben Élni, 2015). Articles in national and international magazines and newspapers were published
to reach as many stakeholders as possible (Komlósi and K. Theisler, 2014; Glatz and Komlósi, 2014). Exhibitions were organised to show the potential of this alternative housing form (RESResearch, 2015). Radio interviews for different radio stations were given to explain the advantages of bottom-up and community-oriented housing developments. Co-housing research projects were organised to involve even more stakeholders in regulated artificial or in real-life environment (REPLAN, 2015; Grand Home Budapest, 2015). The members participate in international networks to collect the data and knowledge from co-housing countries with the aim of finding the possible strategies which can be implemented in non-co-housing countries (Komlósi, 2015). The result of their work cannot be measured by the number of new co-housing projects but the rising number of stakeholders realising the potential advantages of the co-housing movement is promising. More and more potential residents, professionals from different fields, researchers and politicians join the movement (Grand Home Budapest, 2015). It is clear that it requires a higher number of activists and potential residents to strengthen and extend the movement, so we need more enthusiastic people with various social, economic and professional backgrounds.

About 5% of the housing stock is co-housing in Switzerland. Although it is a small percentage, they have a very important position on the housing market. The spectrum of co-housing projects is getting wider but it requires further growth. Almost all of the stakeholders have an active role in the process. Presently almost all of the stakeholders have an active role in the process, the number of co-housing residents is continuously growing, there are well trained professionals and politicians have also started realising the advantages and have started promoting the movement. Increasing the number and efficiency of researchers and activists would facilitate the process. Compared to other co-housing countries like Germany, Austria or the United Kingdom, Switzerland needs more research projects running and more promotional and educational workshops and events organized (Huber, 2008). Regarding platforms Switzerland is also quite developed. There are meetings for residents and potential residents, there are several guided tours, the number of articles and books dealing with co-housing is increasing, there are organisations who promote the movement, there are smaller and bigger conferences on local and national levels (WBG, 2015; Kurz, 2012; Zulliger, 2008; Plattform, 2015). A few radio and tv interviews, short films are also available (DANACH, 2012). The number of programs in the social media and on trendy platforms like Youtube or Twitter is very low. The target group of the co-housing movement is still very defined and small. Switzerland and its co-housing movement focus mostly on its national and local levels. On the residential and neighbourhood level they have very good relationships and connections (Plattform, 2015). The biggest cities like Zürich, Lausanne, Geneva, Bern and Basel have advanced co-housing movements but the smaller towns or villages have less knowledge about the topic. This inequality should be changed. The
stakeholders could benefit a lot from being part of an international network however this still needs to be established and developed.

**Conclusion - The grid of platforms, stakeholders and levels**

Co-housing is a potential way to reach resilience in housing. According to its advantages the idea of the co-housing movement should be spread worldwide. Knowledge transfer (introduction, promotion and education) should always be tailor made for each country. The variety of platforms, stakeholders and levels are already given for the complex development process.

**References**


Resilience: Co-fighting the crisis
Emanuele Giorgi, Giorgio Davide Manzoni & Tiziano Cattaneo

ABSTRACT The crisis we are living can be split into three fields: an economic crisis, an environmental crisis and a crisis of values. They are crises that affect different aspects of life, while remaining strictly connected to each other. Our Western society has not yet proven to be able to reform substantially itself so enough to respond strongly to this crisis situation. Moreover a pushed individualism makes stronger the perception of helplessness in front of the crisis. However, from various fields, innovative experiences are growing: they want to solve this situation, making the crisis as an opportunity to realize changes that can establish new relationships between people. This happens also in architecture, realizing spaces that can promote new ways of living. New forms of collaboration and sharing are being developed in the Western world: in particular, cohousing, co-working and co-design. These sharing networks have born as a reaction to the effects of the crisis but in the same time they fight the causes of the crisis itself. The research aims to compare case studies of cohousing and traditional housing with a reading tool that express the concept of resilience, in particular, concerning the concept of community. This comparison puts in evidence how cohousing can be considered a resilient way of living buildings and cities. These experiences arise often for economic reasons but the analysis shows how they produce soon other effects: they increase personal support and relationships; from the considered cases is observed that these forms of sharing promote often neighbouring production, local trade and environmental sustainability.

KEYWORDS: Cohousing; comparative analysis; design strategies; text mining.

Introduction on contemporary situation and opportunities
It is indisputable that Western civilization is going through an important period of crisis, not just economic or environmental, but with wider range and dangerousness. The West is undergoing violent transformations. Supported by the rules of economy and by technological possibilities this situation is destroying, local realities, communities and individuals. Individualism seems to be the only way of life and the loss of personal relationships translates, as evidenced by numerous scientific psychological researches, in a reduction in the levels of individual happiness (subjective well-being, SWB) (Dolan, Peasgood and White, 2008). It is already clearly proved that society must rediscover the values of sharing and guarantee a sense of identity and community that facilitates troubleshooting and help to engage the challenges that the crisis cast to us. For these actual reasons is really important to deeply understand the features of shared living models. The purpose of the research was exactly this: understand if, in architecture, there is any kind of correspondence between cohousing and the concept of resilience. So if the practices of cohousing prove to be, for
their characteristics, the most attractive in times of crisis, offering the ability to adapt to the changes of the surrounding environment, while confirming their identity. Throughout all the history, the collective housing had a central role and have been marked by the free will to participate to them (Phalanstery, Israeli Kibbutz or Chinese Tulou). Nowadays cohousing is more and more studied by the scientific society; nevertheless its features of resilience is still few examined. Can we affirm that cohousing is more resilience than the traditional housing? By an impartial semantic analysis and an ample analysis of study cases we want to give an answer.

Definitions and application fields

Since this is a period of strong stresses for the structure of the society, the term “resilience" is becoming more and more researched in the urban and architectural design. Form literature we can obtain a mass of definitions, all the more that any research field can develop its own idea of resilience. We can also add that often the idea itself of resilience is defined in contradictory way also in the same field. To overpass this strong limit of the literature, we decided, even if we have an our own idea of resilience, to extrapolate the key features of of this concept trough the semantic analysis and applying it to the field of urban and architectural design.

Methodology

To evaluate the degree of resilience in the projects of cohousing, we proceeded through a comparative analysis (as already proposed by several works and papers), comparing 40 cohousing case studies with 40 cases of traditional housing. The comparison have been conducted through a reading tool, composed by objectives and assessment parameters, deduced by a text mining procedure, carried out by an informatics tool combined with a personal elaboration. Nowadays the semantic analysis and the text mining operations are highly exploited by the scientific community insomuch as several informatics tools have been strongly developed (T-LAB, ATLAS.ti, R, etc.). From the research on “Google Scholar” at the entry “urban resilience” the authors selected the papers and document with an higher relevance with the topics of architecture and urban resilience, obtaining as result a list of academic sources. From this list the first 30 papers and publications have been processed by the text mining tool. From the resulting list of words, the first 30 with higher occurrence have been analyzed and elaborated by the authors, to report them to a design level. Once removed the topic word “resilience” and defined 5 main categories (coming from the words with higher occurrence), the other words have been divided in “actions” and “entities”, according with their nature, and so a series of design parameters have been defined (Fig. 1).
Fig. 1 represents the procedure used to define the assessment parameters of the "reading tool for resilience". Starting from the list of words with higher occurrence in papers with topic "urban resilience", the words have been elaborated to obtain five main categories and several parameters.

A term that refers to the concept of "elasticity" does not appear in the list of words obtained from the tool. However, as reported by www.resilience.org and by Nicolin (2014), the concept of resilience relates exactly with the idea that a system is able to deal with negative events without be broken: it is able to modify itself and then, through an elastic reaction, reassert its integrity and original purpose. Considered the centrality of this concept, also the idea of returning to its original condition is introduced in the following assessment points.

**Assessment parameters**

1 – CITY
1.1 – integrate in the local context, developing and managing the interconnections between the social, natural and organizational systems, (infrastructures, information, etc.);
1.2 – strong innovation impact for the environment in the social and urban processes;  
1.3 – developing density, diversity and the mix of uses, users, building typologies and public spaces (with a strong difference with the “zoning”);  
1.4 – flexibility and adaptation to the changes of the urban area;  
1.5 – involving of the neighbourhood, developing the participation, at all the scales, of the members of the community;  
1.6 – planning to become a focal component of the contextual systems and increase the local sense of identity.

2 – RISK  
2.1 – project based on creative use and diversification;  
2.2 – planning redundancy of functional components to assimilate changes and accidents;  
2.3 – assessment of the environmental and social impact (at local level and at big scale) and of the hazards that can be originated;  
2.4 – developing the awareness of the hazards and of the vulnerability of the project;  
2.5 – assessment and reduction of the hydro-geological hazards (water flood);  
2.6 – management and adaptation to unexpected changes.

3 – ENVIRONMENT  
3.1 – developing dynamic systems for the auto-production of energy;  
3.2 – production of the needed resources in a restricted proximity range (local);  
3.3 – planning the integration in the natural local system;  
3.4 – developing and preserving of the bio-diversity and of the natural local resources;  
3.5 – use of the soil looking for a qualitative and dimensional safeguard of it;  
3.6 – management of the environment as heritage.

4 – COMMUNITY  
4.1 – capacity in learning from the experiences and sharing of skills and information;  
4.2 – governing and adapting to different situations, incorporating changes;  
4.3 – shared management and wide collaboration among the residents;  
4.4 – planning to use local energies and resources for the conservation, enhancement or creation of focal spaces for the community;  
4.5 – knowledge of the territory and awareness in the government of the territory;  
4.6 – planning auto-production of foods and goods.

5 – BUILDING  
5.1 – planning a project with differentiation of the spatial scales;
5.2 – management of the temporality of the building (duration/use/materials);
5.3 – planning the modularity of the construction;
5.4 – assessment the economic/social/environmental impact of the building materials;
5.5 – planning the flexibility and the adaptation of the spatial use and the capacity of adaptation to the changes.

Application: selected case studies on cohousing and housing

40 cohousing projects and 40 traditional housing projects from all around the world have been analyzed through this framework of parameters and design strategies. This section collects just six examples, to represent the analysis procedure, and the final results which show the comparisons between the two approaches, referred to the meaning of resilience.

**COHOUSING 1 - NumeroZero, CoAbitare association, Turin (I), 2011**

Project of restoration of an old building in the city centre of Turin, it has been promoted by the cultural association CoAbitare. The project has been developed, from design, financing and construction phases, by the cooperation of the people that nowadays lives the building.

- high level of cooperation and sharing of the skills;
- integration in a central city district, but with high social problems;
- sharing of the decisions for design and management;

**COHOUSING 2 – Belterra, CDC and Mobius Architecture, Bowen Island (CAN), 2011**

36 dwellings are placed in a forest context of ten acre, integrated with common facilities, in particular a “Common House” with kitchen and common activities spaces. The project can combine easily private environments with opportunities for interaction with other habitants.

- sustainable approach integrated in the natural surrounding system;
- it is integrated also in the transportation system, so to reach Vancouver in 20 minutes;
- people participate from planning and design process, until management and maintenance;

**COHOUSING 3 - OWCH, PTE architecture, Barnet (UK), 2013**

20 older women decide to start a project that would allowed them to live in a community sustaining each other in the growing old. The design process combines individual aspirations with practical requirements, reaching 26 dwellings and several common facilities.

- common services for residents and for guest of the community;
- creation of an inner landscape garden that allow open activities and guarantee safety;
- strong relation with the neighbourhood and social context;

**HOUSING 1 - VM Houses, Bjarke Ingels, Copenhagen (DK), 2005**

VM by BIG, the first residential building realized in the new district Ørestaden, consists in 255 dwellings divided in two buildings shaped like V and M. The apartments, 80 types, face on long corridors which zigzag shape ensures light, sociality and views on the surrounding.

- high differentiation of the supplied typologies and availability to reach the users’ needs;
- re-interpretation of the Unitè d’Habitation distribution system;
- high control and management of the construction costs;

**HOUSING 2 - Makuhari Bay New Town, Steven Holl, Chiba (JAP), 1996**

This Housing is composed by six buildings that include units with residential and commercial destination. The combination of “silent heavyweight buildings”, “activist houses” and semi-public gardens, create a continuous sequence of peaceful and liveable spaces.
- the goal is the spatial reorganization of lots to safeguard the variety of spatial experience;
- strong references to the conceptual and the figurative Japanese culture;
- six houses, public or private, want to create sounds between silent buildings;

**HOUSING 3 - Black & White Houses, AGi architects, Yarmouk (KW), 2009**

A compact complex of six houses linked in a labyrinth of outer spaces which provides, thanks to a deep study, natural ventilation and lighting. The buildings are differentiate from the busy surrounding context and the result are introverted courtyard houses.

- the opening of the houses are oriented to the inner courtyard;
- volumetric composition defined by the contraposition of white stucco and black stone;
- sustainability approach through soil-greenery, ventilation and sun exposition studies;

**Results and conclusions**

The following pictures (Fig. 2 and 3) resume graphically the result of the application of the assessment parameters on all the 80 cases token into account. Even if all these study cases have really different features and locations, it’s exactly with the distinction cohousing/traditional housing that the consideration about the idea of resilience gives very clear results.
Fig. 2 shows, by diagrams, the average results of all the 80 study cases for cohousing (left) and housing (right), proving the higher attitude of cohousing projects in respect to resilience features.

Fig. 3 represents the average results for each point; the full colour means a frequent presence of the feature, while light colour means uncommon feature.

From the results of Fig. 2 we can appreciate the contribution of the research in term of originality: it’s proved first of all that the architectural characteristics of resilience are more frequent in the way of living in community instead of the traditional way of housing; so this means that we can consider resilience the housing model of the shared living. Moreover we can see how, for cohousing, the higher values of resilience are present and in the main categories of “community” (which is the distinguishing peculiarity of those kind of projects) and in that one of the “city”, thanks to cohousing tendency to create relations with the surrounding (Giorgi et al., 2014). These aspects can be considered as a step forward in the literature of the study on features of cohousing; in particular, in future researches, could become interesting examine deeply in detail the characteristics that make resilient an architecture and so, once improved the points of the analytic framework, think if it’s possible to define architectural interventions to increase the degree of resilience of a building.
References


Notes

1 We are referring to the experiences in which the communitarian participation is not forced by external forces (as government) but it is the result of the people free willing.

2 Regarding the complexity of the definition of resilience and the application fields of this term, we refer to “Taking “resilience” out of the realm of metaphor”, available on the website www.thenatureofcities.com.

3 Consider, for example, the assessment parameters for comparative analysis by Cattaneo and De Lotto (2014).

4 The quantity of 30 documents has been chosen because it’s a good compromise between the power of the text mining tool and a significant statistic value.
Session 3

Theories for Resilience
Greenhouse Superstructures as Social Pedestals:
Displaying site-specific non-locality
as a possible form of resilience

Luis Berriós-Negrón

ABSTRACT In this paper I will propose that greenhouse superstructures are not just the surface envelop of an industrial typology: they are more so a spatial archetype. As such, they are historiographical boundary objects that at times display the spatiotemporal dimensions and geopolitical flows of environmental form in accelerated climate change. This abovementioned hypothesis is reflected through the manifold of “resilience” as defined by Prof. Lawrence Vale - of resilience being “a window into conflicting human values”. The aim of this effort is to ultimately centre the manifold notion of “greenhouse” as an index that points away from itself towards the impact of anthropological and technocratic ideologies on agricultural and spatial production. It is these binary ideologies that arguably create what we sense to be a crisis of scale, now further articulated as the hyperobject of climate change as a disjunction that we nostalgically entertain as a chasm between the human condition and the living environment. Parse by augmenting the notion of greenhouse superstructure as concept, building, technology, gas, problem, discourse, and solution, the hypothesis looks to articulate the greenhouse as a site-specific non-local sensation on the expanding sculptural field. What this expanding sculptural netherworld implies needs to be rigorously addressed for it may very well become what tautologically heightens the greenhouse to the providence of our atmosphere and landscape. To elaborate this potentiality, I will first present the schematics and precedents of the dissertation, including four installations in Germany, Brazil, and Sweden. These sections then lead to an argument instantiated by thinking of the greenhouse as social pedestal. This fundamentally questions the correlational crisis of scale in environmental form. In this case, the objective is therefore to embody the notion of non-local site-specific resilience as modes of pedagogy and production that aspire to destabilise the anthropological machine, as resilient modes not limited to historic, scientific, artistic, correlational, nor speculative conventions.

KEYWORDS: Resilience; greenhouse superstructure; climate radicalisation; boundary object; preparation; hyperobject; crisis of scale; site-specific; non-local, social pedestal.
"Once upon a time, there was an Empire whose Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guild struck a Map of the Empire whose size was that of the Empire, and which coincided exactly with it. Less so addicted to the Study of Cartography, the Following Generations saw that the vast Map was Useless, and not without impunity did they submit them to the Inclemency of the Sun and the Winters. Still today in the Deserts of the West, are the Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography."


Introduction

This paper presents a hypothesis - industrial greenhouses, or greenhouse superstructures (Max, Schurr, et al, 2012) may display, as social pedestals (Kølbæk Iversen / Berrios-Negrón, 2013), the complex of environmental form in the context of accelerated climate change. This type of display here proposed, not as curatorial or architectural style, but as contemplation, action, and instantiation, has multiple dimensions. In this case, this conception of display is reflected upon “resilience” (Vale, et al, 2005-2014) towards contending with the consequences of climate change, and is treated as a fractional component (Law, 2002) that will embody a greater greenhouse index as my on-going doctoral dissertation.

The title of the dissertation is “Breathtaking: the display an environmental index about the landscapes and atmospheres of Site-Specific Greenhouse Superstructures in the context of
accelerated climate change." It is a practice-based, research and development effort that looks to augment the definition of greenhouse superstructures – of industrial greenhouse surface envelops, or cover-structures. This effort is also an aspiration (Appadurai, 2003) – a critical assessment that relies less on mapping and modelling, and more on scoring and demonstrating the representation of the neocolonial paradox of disarray, where, for instance, the term “greenhouse” is, at once, a concept, caution, cause, problem, method, and solution to the increasing unpredictabilities of global warming. The fundamental question that emerges from this proposition is - can this paradoxical disarray, embodied in the figure of the greenhouse, be a resilient medium towards sensing the complex that is accelerated climate change? In order to begin to inform this question, I resort, albeit opportunistically, to the concept of “resilience” not just as a developed observation, but as a way to “rebuild”. In this case, I want to think of resilience more as a preparation, as an epistemic form (Rheinberger, 2010) that makes-visible alternative modes of rematerialisation towards contributing to the seen, unseen, sensible, yet unimaginable complex of environmental form. I filter this hypothetical position through a brief historical account of the greenhouse, including various artworks that acutely deal with greenhouses as subject matter. With that material I attempt to parse various notions in Vale’s Eleventh axiom of Resilience and Timothy Morton’s hyperobject (Morton, 2013). By oscillating between these various notions, that include cybertcity, site-specificity, and non-locality, I hope to understand and then articulate an object of display that is less a physical pedestal, or retinal figure, nor speculative action, but more so a coherent array of circumstances and potentialities. More specifically, Vale’s “resilient window” can be easily assimilated to the concept of a boundary object (Star, 1989), as a cultural thing, abstract or concrete, that alone may have little value, but when situated, gives manifold access to many participants and observers to a more ample social and analytical reality. The greenhouse as a social pedestal is rooted in this type of concrete site-specificity. But, as the glassy affair that the greenhouse is, it is also reflected through Morton’s hyperobject, letting this viscous thing in itself flow as a non-local form. This oscillation is intended to facilitate broader, heightened sensations of climate change we are unwilling or unable to sense otherwise.

The greenhouse: very brief history and current report

Greenhouses have become an assumed subject matter of cultural production. Historically, ca. 30 C.E., we see traces of what is considered to be the first example of a greenhouse, what roman emperor Tiberius commissioned (somewhat ironically) to be a “specularium”, a year-round medicinal garden at his imperial Villa Jovis in Capri to grow medically prescribed, fresh vegetables through the entire year (Paris, H.S. and Janick, J.,
From there, perhaps the most prominent example regarding the importance of the greenhouse in cultural life was the industrial age icon, Crystal Palace in London. Crystal Palace, built in 1851, was itself the triumphant embodiment of 19th century imperial colonialism, construction technology, and industrial production. It was where steel and glass singularly and truly met for the first time at a monumental scale, discretely connecting yet separating nature and man, interior and exterior confused. It was also site of the Great Exhibition where the display of industrial technologies, fine arts, and the exotic natures of other lands were transplanted for the public to inhabit as a controlled atmosphere... it truly was, and still is the emblem of the industrial paradox. The success of Crystal Palace launched the sprouting of glass palaces as a must-have typology of civic space in many major European cities, and beyond, during the rest of the 19th century. These glass palaces, from Paris to Prague, from Copenhagen to Munich, and even to Sydney, not only housed interior botanical gardens with the public and scientific fascination over evolutionary studies, but also undoubtedly housed art works, most notably sculpture. Already in the early 20th century, influential voices, such as Bruno Taut who qualified the glass palace as the desirable architectural form of his time (“Ohne einen Glaspalast ist das Leben eine Last” - Behne, 1914-19), or where as Paul Scheerbart proclaimed a patriarchal world of glass landscapes in such novels as “The Gray Cloth with Ten Percent White: A Ladies' Novel” (Scheerbart, 1914), it is in this period, at the dawn of modern architecture, that the contested space once known as the “orangerie” could now be truly called the “glass palace”. But, it was not until later, with the great famines of the 1940-50's in various parts of the world, particularly in India, that we see a spurred market for crop engineering and food industrialisation arise, especially in Europe and in North America. It is here that a transformation occurs, from the “glass palace” into what we know today as the “industrial greenhouse”. From that point on, and in the last 25 years, the industrial greenhouse has, and continues to be an exploding industry in itself, not just the agricultural aspect, but also their actual construction. This fact, combined with the prominence of urban agriculture, new fabrication technologies, awareness of health issues over fertilisers, genetic engineering, the on-going increased demand for food, the labour economies that this creates, and ultimately the matter of climate change, is what unmistakably positions the greenhouse exactly at the crux between technological innovation, scientific space, and cultural practice. Due to these profound, difficult-to-discern forces, an ensuing, consistent, exponential growth of greenhouse construction around the globe, of up to 20% p.a. since the 1990’s (L.C.A.M., 2009) is still on-going, with China leading the charge by already approaching three million hectares of new greenhoused land (Kacira, 2011). This radicalised, paradoxical, if disparate expansion of colonialized and encapsulated land is present as enormous fragments across many landscapes around the world, where endless deforestation for arable land and the
ensuing installations of standardised greenhouses cover vast areas of land with skins of glass and plastic without regard to climate impact nor environmental context. This reality is surely not what Scheerbart had in mind, and is particular way to incite what has been called a crisis of scale (Kepes, 1965) between the human, biological, and cosmological scales of space and time, yielding, not “security”, but more so an intensified, highly problematic, visual, social, and environmental complex. As per Kepes - “…every magnitude has its own structure. If limits of scale are overrun, either a new level is reached or the old level collapses. If two scales are mixed, confused […] then there is an out-of-scale condition. The pattern loses its connectedness with its field. There is a state of crisis." This crisis goes beyond just the visual or perspectival issue of landscape. It is through this visceral, atmospheric realisation that we find a deeply ambiguous, metaphorical contradiction - of how our landscapes may be “breathtaking”, not in the romantic, emotional sense of reacting to the beauty or magnificence of a landscape, but in the physical sense, of just simply not being able to breath. Likewise, the greenhouse as agricultural superstructure may very well become the overarching manifestation of the built environment as “breathtaking” archives and spectres (Derrida, 1994-95), literally producing an overwhelming feeling that takes our breath away, by betraying, thus dematerialising the presence and image of our landscapes into a largely indiscernible by-product, a future ghost coming to talk to us in our present being as an elusive evolution of human production in disjuncture with nature – now referred to as “greenhouse gasses” and “greenhouse effects”.

Art perspectives of the greenhouse

Accelerated climate change, in scale and proportion, is driven by consumerist population growth and its ensuing byproduct - global warming. This strongly suggest a geopolitically heightened onslaught of technologically and ideologically controlled atmospheres and landscapes that go well-beyond nation-states. But, when it comes to food security, there is little to no evidence that this matter of scale and proportion is being considered by the agricultural, engineering, nor architectural disciplines. It is artists who are perceiving and pointing to the vast problems particular to landscape, atmosphere, health, and justice through the greenhouse as subject matter, without giving-in to business or consumerist models of sustainability. One of the strongest pieces of evidence about how artists point to this enormous problem is the monumental photo and film project Manufactured Landscapes [Baichwal (film) / Burtansky (Fig. 1, photo series), 2006-11] which compellingly reveals the unconsidered crisis of scale of mass consumerism and how it manifests as both a mental and physical atmosphere and landscape. It is works like Burtansky’s that discretely point towards a neo-colonial machine that is intent on profitability concerns, not visual, nor wholly
environmental when we think of human and non-human habitability. Other artists have been playing a crucial role in questioning the greenhouse, creating and enabling landscapes and atmospheres as part of building an alternative collective consciousness. For instance, one example is Mark Dion’s Neukom Vivarium (2006), a commissioned installation artwork that still occupies a focal intersection of the Olympic Sculpture Park in Seattle, U.S.A. The artist collaborated with architects who worked with a prefabricated greenhouse manufacturer to push beyond the building type’s traditional form to create the structure’s dynamic form that houses a very large, fallen “nurse-log”, or a recovered tree trunk laying on its side, working as living ecotope. More presciently, the work of Critical Arts Ensemble member Claire Pentecost, with her project Intensive agriculture in plastic greenhouses by the sea in Almeria, Spain, (2005), where she documents in film and photo the abrupt and complex environmental, political, infrastructural and social transformation of the Almeria region due to the explosive growth of greenhouse food production. These artworks are just a few samples of the relevance agriculture and greenhouses have in regards to visual, social, pedagogical, and critical artistic practice that offer views into the precarious reality of agriculture in the social mind and the challenges it faces in order to recover sustainable proportions between human, non-human, biological, and cosmological spatiotemporal scales.

Samples of Site-specific Greenhouses Superstructures as Social Pedestals

Taking the aforementioned projects as precedent, four samples of Site-Specific Greenhouse Superstructures (Berrios-Negrón, 2011-15) are here discussed below. These installations specifically address critical views about science fiction, the future of natural science, collective imagination, and the reorientation of environmental form, respectively. As samples of social (hyperobjective) pedestals, they nurture a memory of what greenhouses may represent beyond the conventional idea of agricultural or horticultural technology.

Immediate Archeologies Two, mixed media, ca. 2500qm, curated by Lukas Feireiss, Dresden (2009)

As an extension of its first iteration in Berlin, Immediate Archaeologies Two (or The Children’s Crusade) triggers a buoyant psychogeography of this abandoned slaughterhouse, former war prison in Dresden. It is an additive excavation that searches to re-enact the mindscape of time-warped Trafalmadore, the mythical planet, or haven, constructed years before by Kurt Vonnegut’s experience as prisoner of war and ensuing Slaughterhouse Five science fiction novel. This time, the processes took the shape of a “potential” greenhouse, a boundary object questioning the subject between history and knowledge, fact and truth, to temporally fabricate a theatre that activates a static past into a noöspheric future.
The Living Archive Course reviewed the future of archiving natural history by redefining the greenhouse in the context of climate change. Reviewing its definitions served as probes to consider and give alternative notions of how our realities (social, atmospheric, and geographic) are changing the ways we see and build cultural and spatial production. In order to mediate these complex issues we considered and developed “greenhouse” as a loose term, as ready-made, and boundary object about archival spaces and future landscapes. The final greenhouse was built collectively with the students, measured 24.7m², and remains as a permanent installation in the campus’ wetland and garden of the nutritional sciences department of the University.

The Looming Greenhouse (“Tear do Terreiro”) was a commissioned installation for the 3rd Bahia Biennale of Art. The installation was a large scale set of infrastructures around the Castro Alves National Theatre (José Bina Fonyat Filho, 1957-68). The overarching intent of the Looming Greenhouse was to potentiate the roof surface of the theatre as an index and chronotope (Jones, 2014) as a time-based collective thought that points away from itself, in this case, towards a possible medicinal garden as public space. This act to potentiate the garden is the social pedestal, all articulated by the use of three public infrastructures.

Through Paul Ryan’s Earthscore notation, this installation situates common interrogatives as an environmental form: physically, it will be a loose, habitable 1:3 scale model of the volume of the Färgfabriken building as a miniature replica of an industrial greenhouse; figuratively, it will be an industrial spectre of itself coming back to talk to us in the present; formally, it embodies a reorientation towards environmental coordinates while housing the artist, family and guests. These interrogatives are intended as non-local and site-specific qualities of sensational representation within our modern, retinal dysfunctions.

Questioning technology and environment has evolved through various forms. One monumental example being the science fiction novel *Neuromancer* by William Gibson, which significantly augments the idea of the cyberspace, giving way to many other related terms.
such as cybercity. From there, we see further development blurring the notions of landscape and environment in regards to information and media through architecture and urbanism. In the case of Prof. Bill Mitchell, we see a commitment towards foreseeing the impacts of information flows and computer systems dynamics on the urban context in his seminal book *City of Bits* (Mitchell, 1995), arguing that the visibility of presence and telepresence, synchronicity and asynchronicity, as the subtle entwining between communicational ecologies, the geographies, economies and landscapes that this creates, are conditions which begin to inform a malleable, arguably non-local site-specific world that is the cybercity. This is not just influenced by the entwining of innovative social and electronic flows, but unequivocally heightened by the onslaught of accelerated climate change (Graham, 2004). These potentialities of cybercity are now being physically driven by more recent re-adaptations of system dynamics and computer aided design. These are known as associative design or design parametrics - methods for modelling and developing computational form-finding and digital fabrication processes. Predictably, we see these tools fall to dogmatic belief systems, case in point, so called parametricism (Schumacher, 2008). This is detailed (if satirized) in a previous paper titled *Paramannerist Treatise* (Berrios-Negrón, 2012) but it is worth mentioning that Schumacher’s parametricism is incongruently argued through Marxist references, all but ignoring the well-known Marxist philosophy described as parametric determinism where "Men and women indeed make their own history. The outcome of their actions is not mechanically predetermined. Most, if not all, historical crises have several possible outcomes, not innumerable fortuitous or arbitrary ones; that is why we use the expression ‘parametric determinism’ indicating several possibilities within a given set of parameters" (Mandel, 1989). It is also important to mention incisive comments that best illustrate the reductive, control driven impulse of parametricism by stating - "The formal exuberance characteristic of Parametricism’s architecture and urban planning scenarios pretends to cope with societies’ and life’s complexities, while in fact they are at best expressions thereof, empty gestures of a form-obsessed and strangely under-complex approach to architecture and urbanity" (Rocker, 2011). This very brief overview exemplifies the cybercity as an unwitting subject of parametricism, viz. as a reductive abstraction that could loosely be ascribed to an ecological sovereignty (Smith, 2012) viz. the deformed ideas of ecology that de facto operate as closed, topological circuities of control against poiesis. It is here that I would like to begin to reflect on that cybercity that is within the Eleventh Axiom of Resilience. The type cybercity asserted in this axiom contrasts these closed deformations of ecology to suggest a more provocative, open oscillation as non-local site-specificity. And, this is where a parallel to the concept of the hyperobject occurs. If we are to similarly consider the vast problem of accelerated global warming as a project of rebuilding a devastated city, whether by resource wars, or climatic disasters, it is perhaps
also similar to think of it, as Vale proposes, not just as a technical or physical challenge, but also much more as “a window”. But, to amplify that notion that Vale suggests as an image, lets think of it instead as a monadic window (Bredekamp, 2008) in which a theatre of nature and art is revealed, playing out a deeply thickened landscape and atmosphere overlaid with information, in this case not just of electronic capital, but of multidimensional will - an aspiration and a resilience to overcome adversity. As Professor Vale states - “You think you have a technical design problem to solve, but what you have is a window into conflicting human values…” (Vale / O’Neill, 2014). And, it is this window in the body the greenhouse that further offers something familiar yet elusive: the unravelling consequences of climate radicalisation as an ambiguous locality that somehow allows us to sense remote physical, digital, and mental worlds as a constitution of our reality. One could therefore argue that this notion is strengthened by pointing to Vale’s Eleventh Axiom of Resilience and its similarity to the notion of “non-locality” in Morton’s hyperobject. In tandem, these objectify a strange triadic value. Now, we think we know our physical location and the consequences of our lifestyles, especially due to the demographic data offered through Geographic Information, Remote Sensing, and Global Positioning Systems yielding a slew of models and mapping structures; structures that due to military and economic mandates, can become all but clear, especially if one were to think of how transnational interests are rarely registered and thus blur the boundaries of state, property, and geography. In this regard, the Eleventh Axiom of Resilience states - “The site-specificity of resilience will increasingly follow a different trajectory…” (from the common affliction of disasters) “given the global flow of electronic data and information. This means information and communication networks can all too easily be obstructed by a disruption at some key node.” Vale further states that different cities will recover differently from one another according to their resources, but – “Inevitably though, the world’s on-going litany of disasters will continue to intersect with the hyperconnected realm of the cybercity” (ibid Vale, et al, 2005). Less conspicuous is then the mental picture we think we create about climate change. This picture is wholly inadequate due to the retinal dysfunctions we have been nurturing by way of the positivist, “seeing is believing” trope. It is Morton who acutely states that - “hyperobjects are massively distributed in time and space such that any particular local manifestation never reveals the totality of the hyperobject.” This lack of “revelation” is perhaps the core of that unwitting blindness instilled by the consumerist bliss inculcated during the late 20th century into the cortex of western psyche, now rapidly advancing in the largest developing economies, projecting a dire outlook for habitability.
Conclusion

It is in the dance between the proposed notions by Vale and Morton where this strange transversal section between resilience, hyperobject, and social pedestal may yield a type of object as conscious thing. Ultimately, this conscious thing may occur as a non-local site-specific resilience best represented by critically placing the greenhouse front, back and centre as archive of natural history. This is not the nostalgic object of colonial desire, but as a Deus ex Machina, of a sudden yet self-fulfilling prophesy of habitable landscape and atmosphere that allows the emergence of life as a *natural teleology* (Nagel, 2012) that is sceptical of the materialism and creationism binary mind. It is this triadic strangeness that will primarily continue to occur when considering how to give body to ensuing versions of Site-Specific Greenhouse Superstructures in various forms and formats. The forms and formats of these works, which include the PhD itself, are intended to reflect the paradox of conceiving, designing, and building greenhouses as sensation of the scale of accelerated climate change - of climate radicalisation.
References


The Magical Encounter Between Resiliency and Emancipation? A whatever architecture

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ABSTRACT Adopting an alternative route and trying to avoid an unnecessary relativism vortex and a theoretical nonsense, I would try to speculate on the possible encounters between resilience and emancipation say considering them as “notions in struggle” as they continually operate in a series of tensions and reconfiguration. This short reflection will focus around the current debate over the need to reclaim the political emancipatory project of architecture, against a technocratic, biopolitical and arrogant one. I would offer few interventionist concepts or idée-forces that attempts to reconfigure the given matrix of references of such concepts, suggesting architecture should “practicing dissensus”, meaning should develop strategies and interventions that require political thinking and speech to activate new idea of order and new subjectivities and “becoming inoperative”, meaning acting in neutralizing its ordering forces and making it available for free uses. With an explicit and incomplete reference to Jaques Rancière and Giorgio Agamben political reflections the paper1 wish to offers a renewed perspective on architecture by suggesting a reorientation between politics and aesthetics that would not simply reorder power relations, but create new political conditions as well as – new subjectivity.

KEYWORDS: Ranciere, Agamben, theory, emancipatory, use.

Introduction

As the resilience debate is getting to its apex encompassing how we respond to a world of rapid change, complexity and unexpected events, but also a shifting relationship between our understanding of human agency, its potential and efficacy, and our aspirations for improving, securing and developing the world we inhabit, we might then resisting resilience not only planning the resilient city at the technological level, but rather integrating all aspects of urban life, including the right of appropriation and adaptation.

To think is to subvert any rigid distribution of classes, place or norms. Such context, dissensual, opens an alternative way of debating the intersections between resilience and resistance towards what Francois Roche called “Reclaim Resiliencestance “The stuttering between Resilience (recognition of vitalism as a force of life and innovation) and Resistance (“Creating is resisting”) will be the goal…“.
This short reflection will focus around the current debate over the need to reclaim the political emancipatory project of architecture, against a technocratic, biopolitical and arrogant one. An emancipatory project that hopefully would reclaim the much-too-early abandoned critique of contemporary capitalism and its subsequent production of urban space without risky to get trapped in discursive practices simply camouflaged as radical, overly disciplinary and expert-oriented-constructed.

In doing so I would offer few interventionist concepts or idée-forces that attempts to reconfigure the given matrix of references as they confront architecture's comfort zone, suggesting that architecture should "practicing dissensus", meaning should develop strategies and interventions that require political thinking and speech to activate new idea of order and new subjectivities and "becoming inoperative", meaning acting in neutralizing its ordering forces and making it available for free uses.

With an explicit although incomplete reference to Jaques Rancière and Giorgio Agamben political reflections offers a renewed perspective suggesting a reorientation between politics and aesthetics my aim here is to sketch out the potentiality within Rancière and Agamben politics, which can affect change today in the architectural discourse and especially around the possibility for a radical inclusive architecture, not indulging but acknowledging the complex, historical interconnections between them. This has implications for our understanding of the disciplines and the practices and their roles and responsibilities in constructing society and futures. Rancière argue that politics can only – thus rarely - occur when the logic of domination intrinsic to any police order (urbanism and its spatial dispositives are certainly visible here) find confronted with a logic of equality. Agamben argues that politics is Messianic thus “fulfilling” the law, not overcoming or destroying it. It does not seek a revolution, or a profound a big change but a small one a small shift which renders the state of exception inoperative. As such being political today in architecture is renouncing the techno-philosophical jargon of the perverse digital capitalism and image industry camouflage and the politics/management complicit dimension. The dismantling of the ontological pillars of the Western philosophical and political tradition with the work of Jaques Rancière and Giorgio Agamben proposes a notion of politics, which renounces representation and upsets the temporality of political imaginary, thus undermining any political project construed around images of the future.

**Rancière’s emancipatory space**

Jacques Rancière’s work, in particular his conception of the dissensus and his notion of active equality - both profoundly socio-spatial in nature - are seen fundamental in elaborating around the political potential of architecture. Rancière defined what constitutes the essential aspect of politics: the affirmation of the principle of equality in the speech of people who are
supposed to be equal but not counted as such by the established police order. For him, proper order will always be interrupted by impropriety, which served to set the stage for his provocative conception of politics as *dissensus*, as scandalous. Politics (*la politique*) exists “whenever the counts of parts and parties of a society is disturbed by the inscription of a part of those who have no parts [and] begin when the equality of anyone […] is inscribed in the liberty of people” (Rancière, 1999:123).

The explicit focus on the excluded, on the part that does not fit in, implies an assumption about the whole, which could be considered the norm, a meaningful and peculiar idea of society and its representation of a symbolic whole. For Rancière politics exists only “[…] when the natural order of domination is interrupted by the institution of a part of those who has no part” and “there is the appearance of a subject, the people […]” (ibid, 11).

This modes of politics, is never static and pure as it is characterised in term of division, conflict and polemics that allow the invention of the new, the unauthorised and the disordered, the unexpected. The “interruption” Rancière is imagining is an “[interruption] of the police order […] that challenge the natural order of bodies in the name of equality and polemically reconfiguring its [aesthetics]” (Ibid, 11). Referring back to the Aristotelian polis, he used the word police to refer to the established social order within a process of governing where the political problem is drastically reduced to assigning individuals their place/position through the administration of the conflicts between different parties by a government funded on juridical and technical competences.

His vision of police can be described as an act of organisation and distribution of bodies/individuals in space, assigning roles and functions. In that sense, police presuppose at least one inequality: between those who distribute and those who receive the distribution and position in a society. All the terms used to refer to those who have no part in the communal distribution of the sensible - the syntax that Rancière employs to mean the visible and speakable world - refer to “[…]a paradoxical excess that cannot be contained within regulatory categories” (Rockhill, 2014:12). Rancière’ police is not referring to repressive forces but rather to the order of things, to the order of the polis, and therefore to the established social order within a process of governing. Since the demo is included by nature in the polis, the political problem is drastically reduced to assigning individuals their place/position through the administration bodies. In other words, a “society is […] divided into functions, into places where these functions are exercised, into groups which are, by virtue of their places, bound for exercising this or that function” (Angelil and Siress, 2012:64).

In contrast, politics in its very essence is constituted by dis-agreement/dissensus, by disruptions of the police order through the dispute over the common space of the polis and the common use of language. To name a phenomenon and assign it its “proper” place is an
establishment of order – thereby an act of de-politicisation. Politics, therefore, is not about identifying the excluded and trying to include them. The logic of identification belongs to the police. Politics proper is to question the given order of the police that seems to be the natural order of things, to question the whole and its partitioned spaces, and to verify the equality of any speaking being to any other speaking being.

The notion of inclusion in Ranciere’s work is rendered as working from the inside-out, emanating from the position of those who are already considered to be democratic, included which reveals a teleological trajectory toward an already known end-state in which inclusion becomes an entirely numerical operation and where the “architectural dispositive” (Lahiji, 2013:61) operate. In contrast: “a political moment would not merely entail the inclusion of excluded groups, but rather an inclusion that, through such including, reconfigures the landscape in such ways as to change the conditions under which arguments can be understood, speakers can be acknowledged, claims can be made, and rights can be exercised” (Rockhill, 2014:144). Radically inclusive architecture can emerge there, in such a reconfigured sensible experience.

Radically inclusive, means not being simply distributive, ameliorative but reversing rather then adopting a reversal strategy that Rancière is staging where instead of putting equality at the end of the process – the given, the provided, the imagined, we were to put it at the beginning. Suppose that we were to treat equality not as a debt, not as a matter of obligatory distribution, but as what Rancière has called a presupposition. Democratic politics concerns the presupposition of equality, not its distribution. Such universal act of putting before to surmise absolute equality, does not amount to a simple distribution of rights within a society but is an “activity rather than a state of being, an intermittent process of actualization rather than a goal to be attained once for all” (Rockhill, 2014:144). As such, because equality can only be actualized in “polemical communities” - those that put at stake the opposed logics of police and politics and are relentlessly transformed by political subjects - that are relentlessly transformed by political subjects. Or, in his words “politics is an anarchical process of emancipation that opposes the logic of disagreement to the logic of police” (Rancière, 2004:90). For him subjectivation, re the creation of political subjects is “the production through a series of actions of a body and a capacity of enunciation not previously identifiable within a given fields of experience (Rancière, 1999:40). Which transposed to architecture means, “any building, like any object, can potentially rise the level of aesthetic experience insofar as any building can disrupt the ordinary sense of experience and therefore reconfigure the ‘distribution of the sensible’” (Lahiji, 2013:63).

He uses the concept of le partage du sensible to describe the many procedures by which forms of experience are organised and distributed. The sensible is precisely what can be thought, said, felt or perceived/the perceptible, the visible, the speakable, etc; the partition is
the act of divide up and share between legitimate and illegitimate persons and forms of activity "[...] the configuration of a specific space, the delimitation of a particular sphere of experience" (Ranciere and Corcoran, 2010:40). In this light, artistic practices (including then broadly design, architecture and space) are forms of visibility that can themselves serve as interruptions of the given partition of the sensible.

As Rancière explains, such a partition is the system of a priori forms determining what presents itself to sense experience. It is a “delimitation of spaces and times, of the visible and the invisible, the speech and noise, that simultaneously determines the place and stake of politics as form of experience” (Rancière, 2006:13). Such a definition is useful for our discourse as distribution implies both inclusion and exclusion in a sensorial manner. Sensible then is both that which can be perceived by the senses and that which make sense to think or to do. In this sense, “Political activity is always a mode of expression that undoes the perceptible divisions of the police order by implementing a basically heterogeneous assumption, that of a part of those who have no part, an assumption that, at the end of the day, itself demonstrates the sheer contingency of the other, the equality of any other speaking being” (Rancière, 1999:29).

Rancière completes and expands this trajectory towards a spatial emancipation and an architecture of dissensus (Boano and Kelling, 2013): a moment in which particular order (spatial for us) is disrupted using a “capacity of enunciation” (logos) for voices, speech and discourses that are excluded, and “the materiality of a body or bodies” In doing so he bridges such material, sensational, pragmatic gap suggesting that politics and aesthetics coincide and so we cannot “reduce architecture as the epiphenomenon of politics” (Lahiji, 2013:62).

Architecture and urban design, are one of the many discursive practices that contribute to the “Janus face” of the governmental arrangements that have solidified over the last two decades and that have created new institutions and empowered new actors, while disempowering others. Architecture appears celebrated, but also relegated, in a role of commodifying instrument of the urban transformation – able to produce quick revenues for developers through the delivery of sacred products for perfect inhabitants and thus perpetuating exclusionary spatial dispositive. Instead being happy with the current critical artillery, intellectual and practical, the search for an alternative narrative architecture is needed: one that contests the mainstream (supernatural and over-imposed) attitude, and pushes, rather, toward the re-appropriation of a communitarian and humanistic nature of the urban – from the resurgence of activism and social engagement in architecture and design to a reconfiguration of architecture’s ethical shift, from the revitalisation of participatory neologisms to the discussion on the expansion of the role of architect (from the development
of new spaces of engagements across many creative disciplines to the reflection on the social role of design).

Practicing *dissensus* is one step but becoming inoperative, is seen as a complementary strategy in order to subvert such mechanisms - of both practices and discourses - the architectural dispositive of the exclusionary the material condition of urbanism to subvert such control and open up other emancipative possibilities.

**Agamben’s inoperativity**

Agambenian reflections are political, provocative and language oriented. His production has been highly influential on recent urban and spatial debates mainly through his popular *homo sacer* (Agamben, 1998), where the notion of exception were mostly discussed and served to suggests the basis for the constitution of extreme spatial organisation in modern metropolis founded on the principles of exclusion and control in a constant indeterminacy that goes beyond the binary distinctions to be had in dichotomies such as inside/outside, centre/margins, inclusion/exclusion. Never speaking directly on architecture and urbanism, Agamben alludes to the contemporary landscape, by saying that the advanced capitalism produces a great accumulation of dispositivi. Despite the fact that the social body is subjugated by the *dispositivi* and has become a docile social body, power is increasingly extending its paranoid forms of control with mechanisms of inclusion/exclusions, while politics has disappeared (and therefore also the political subjects), seconding the governmental machine. It seems that today “there are only *oikonomie* - pure governance, which has the sole purpose of reproduce itself” (Agamben, 2009).

Acknowledging the richness debate on the above, in this part of the reflection we wish to strive to concentrate few lesser-known incisive concepts, which can offer a reinvigorated political possibility of the design act and the architectural discourse (Boano and Talocci, 2014). The first one emerged in Agamben’s *The Coming Community* (1993), around the analysis of a whatever singularity as the subject of the coming community, a singularity that presents an “inessential commonality, a solidarity that in no way concerns an essence” (ibid, 9). The book was a response to the political debate about the idea of community originated in France by the publication in 1983 of Jean-Luc Nancy’s *The Inoperative Community* followed and by Maurice Blanchot’s *The Unavowable Community*. At the centre of the debate stood the notion of belonging and the question of an idea of community immune to exclusion, isolation, and violence. Whereas both Nancy and Blanchot approach the question from an Heideggerian perspective, Agamben takes a route that leads to the disavowal of the very logic of belonging, identity, and representation, and thus quite interesting for an architectural research of radical inclusion.
The argument of the book revolves around the notion of *qualunque* - the Italian translation of the Latin *quodlibet* - translated as whatever. Agamben considers singularity not in its indifference in regard to a common propriety but in its being as such (tale qual è); neither particular nor universal, neither individual nor generic, it refers rather to the “singular” and expresses a pure singularity. Pure singularity has no identity, it is omnivalent: “It is not determined vis-à-vis a concept, but it is not simply undetermined either; rather, it is determined only through its relation to an idea, that is, to the totality of its possibilities” (Agamben, 1993:55). What Agamben calls idea is a “similarity” or “resemblance with no archetypê”, a pre-given universally accepted notion. Being neither particular nor universal this renunciation of identity and its politics does not involve resignation but, rather, as it will be argued later, a new form of political action. Pure singularities “have deposed all identity in order to appropriate belonging itself” (Ibid, 14). In other words, the disappropriation of all propriety constitutes the possibility for the appropriation of impropriety as such. And it is this appropriation of impropriety and inessentiality as the unique being that makes whatever singularities exemplar. The issue is in fact how to move beyond the logic of belonging, beyond the idea of community based on “being in” (Salzani, 2012) In the humongous task of thinking a community without exclusion, inclusion, violence, discrimination, or abandonment, “whatever is a void, a threshold, a finite but at the same time indeterminable singularity and thus pure exteriority, pure exposition […] Whatever is […] the event of an outside” (Agamben, 1993:55-56). The commodification of the body by capitalist modernity liberated it from its theological model, conserving, however, a similarity deprived of its archetype and transforming it into a whatever body.

Whatever singularity embodies another fundamental notion in the Agamben’s philosophy: potentiality. Potentiality is not simply non-being or as he puts “neither simply the absence of an ability to nor its negation” (Agamben, 1999:178). But rather, is “the existence of non-Being” it is the “presence of an absence” the presence of the can that we cannot” (Ibid). As such, whatever being presents always a potential character. It is in fact constituted by “an infinite series of modal oscillations” (Ibid) But not in the mere sense of the potentiality of becoming actual: “Properly whatever is that being which can not-be, which can its own impotence” (Agamben, 1993:32). The potency of not-being differs from that of being because there cannot simply be a passage to its actuality.

That whatever being is a potential being means that it does not have to attain any essence, any historical or spiritual vocation; it has no destiny. What it is and has to be “is the simple fact of its own existence as possibility or potentiality” (Ibid, 39). Existence is no essence and no destiny; it is, rather, an ethos, and ethics means, in this sense, “to be [one’s own] potentiality, to exist [one’s own] (Salzani, 2012). I have elaborated elsewhere the
nature of potentiality, but Agamben suggests that human beings have no proper ergon, no
essence that constitutes their proper energia, their being-in-act; humans are thus argos,
deprived of ergon, which means that their proper existence is dynamis, potentiality
(Agamben, 2005). What makes us human, according to Agamben, is precisely not our power
of actualization, but the potential to not-be, which refers to the fact that we are capable of
our own incapacity.

Agamben therefore relocates freedom on the other side of the spectrum, not in actuality,
but in the domain of potentiality, which, as we have seen, is the mirror of impotentiality: “To
be free is not simply to have the power to do this or that thing, nor is it simply to have the
power to refuse to do this or that thing. To be free is, in the sense we have seen, to be
capable of one’s own impotentiality, to be in relation to one’s own privation. This is why
freedom is freedom for both good and evil” (Agamben, 1999:177).

Seeing as such potential is therefore the first meaning of the coming of the new
community: a community that has no being proper to itself except for its bordering on all its
possibilities, without destiny and without essence, always expropriated, but as such
inhabited by the impossibility of exclusion.

Quodlibet, qualunque, whatever in the sense stand for “no matter what, indifferently,”
etymologically means, to the contrary, that being that as such always matters. Quodlibet as
qual-si-voglia, “what-so-ever” but in the sense of “whatever-one-wants,” is in an original
relation to desire and thus must not be understood as indifference, generality, generic but,
rather, as “being such that it always matters” (Agamben, 1993:6). The book specifically
moved to reflect on the notion of love and facticity we do not have space to explore here,
however the ethical and political proposal here consists in the call to adhere to this
singularity without identity and representation in order to construe a community without
postulates and thus also without subjects (Salzani, 2012). The example of the beloved
person is poignant: “the traits of a loved person are not unessential; their identity matters
completely to love. But, in a sense, they also do not, for if the person changed slightly these
traits, that would not matter to love. Love embraces who the loved one is but also who she is
not, when she is what she is but also when she is not what she is. Love loves her whatever”
(Ibid, 221).

But when this coming community will arrive and materialise? Again we do not have time
to reflect on the messianic time in the whole Agamben’s philosophy here but what would
seems worth mention is that the “coming” of the coming community is thus “always coming”;
it exists in the time of the end. Its politics finds its place neither in the romanticism of the past
nor in the yearning for a utopian future but, rather, in a profound present, in the realization
that within the present lies the possibility/ potentiality of change and transformation (Ibid,
opening up a reflection on a radical change must begin with the time of the present which greatly resemble the transformative potential of Iain Borden used earlier in this text.

The politics that goes from this reflection are not that not one of producing, making, fabricating a new community, a new identity, race, class, people, nation, faith, world order, or earth; rather, it is one that Agamben calls “inoperative.” Inoperativity (inoperosità) translates the French term désoeuvrement, which for Agamben cannot be merely mean the absence of work/activity (assenza di opera) rather, it must be read as “a generic mode of potentiality, which is not exhausted (like the individual or collective action, intended as the sum of individual actions) in a transitus depotentia ad actum” (Ibid, 223).

There is politics because human beings are argos, not defined by any proper operation—that is: pure potential beings, who cannot be exhausted by any identity and any vocation.” (Agamben, 2000:109). Potential is both an experience of privation, as sensation (aestetsis) of being without sensations (anaesthesia). It is both potential to-do and not-to-do. Transposed to architecture, it is an architecture that simultaneously delivers and withholds. Hence the idea of the potentiality – as actualized alterity – is not annulled but retained in actuality: saved, stored and conserved or solved and dissolved.

Therefore, the coming politics has to interrogate the essential inoperosity and potentiality without transforming them into a historical task.

The relation potentiality–inoperosity is fundamental: “Inoperosity is not inert, empty, rather, it lets appear in the act of potentiality that showed itself in it. It is not potentiality that is deactivated in inoperosity, but only the aims and modalities in which its practice had been inscribed and separated. And it is precisely this potentiality that becomes now the organ of a new possible use, the organ of a body whose organic unity has been suspended and rendered inoperative” (Agamben, 2011:104). What is rendered inoperative is an activity directed toward a goal, a function, in order to open it to a new use, which does not abolish the old one but, rather, exposes and exhibits it.

The essential connection between potentiality and inoperosity means that the sabbatical suspension, which by rendering inoperative the specific functions of the living being, transforms them into possibilities, is the proper human praxis: “[…] by freeing the living human beings from their biological or social destiny, they open for them that indefinable dimension that we are used to calling politics”(Agamben, 2011:274). This operation takes the name, in more recent texts, of “profanation”.

Such gesture implies the neutralization of what is profaned, which loses its aura of sacrality and is restored to use. And the creation of a new use is possible only by deactivating an old use, by rendering it inoperative. To profane, in this sense, means to return, to open and rescue those sacred things “[that were] removed from the free usage [al
libero uso] and commerce of mankind, and could not be sold, given as deposit, or ceded in usufruct"(Ibid, 83). To profane means freeing things from the sacred names that set them apart as benefit of the few, to return them to their free or common usage.

Profanation fits into the overall Agambenian work in seeking to deactivate the apparatuses of powers in the interest of a coming community which is only latent, present but perhaps unrealised; and involves a resistance that challenges the contemporary place of language – specifically design language “whose hypertrophy and expropriation define the politics of the spectacular-democratic society in which we live” (Agamben, 2000:x). Applying the idea of profanation to the realm of design and architecture and the spaces it produces, it would mean to return the practice itself to the everyday users of those spaces, and to discard the neoliberal exclusionary logic, which lately has created ‘alien’ environments and thus can open for a “radical inclusivity”. The centrality of profanation is therefore seen not simply as a productive etymological antidote to the quasi super-natural augmented phenomenon of urban design and neoliberal architecture, but as a site of resistance in reclaiming the intellectual productivity of urban design and architecture theory and practice.

What whatever, potentiality and inoperativity mean for a political project is a clear and emphatic rejection of any utopian projection into the future. Radical politics is usually based on imagining that something very different from this world is possible and that the possibilities of this new world lie in the future. To start all over, though, implies a de-cision, the drawing of lines and demarcations between the old and the new, the past and the future, and the violence that goes with it.

For Agamben, on the contrary, it is in the present, that we have to uncover the potentialities for the new world, a supplementary world that exists already, in potential (Salzani, 2012). The coming community already exists, here and now, we just need to take a little break from the world and let it “come”. And this implies rendering inoperative—and available for a new “use”—all historical and utopian projects. The research approach, applied to practice, can be seen as mobile and contingent as it does allow to analyse and then synthesise – or deconstruct and recalibrate – architecture as a contextual, responsive, and ultimately empowering practice that is not about the “destruction” of the dispositifs of exception, but rather about rendering them inoperative by liberating that which has been separated from them: profaning them.

Conclusion: A whatever architecture

The idée-forces suggested above reflecting on the political thoughts of Jaques Rancière and Giorgio Agamben and their interventionist concepts suggest that any attempt to see a possible encounter between resilience and architecture it has to be towards what Francois Roche called “Reclaim Resil[lience]stance “The stuttering between Resilience (recognition of
vitalism as a force of life and innovation) and Resistance (“Creating is resisting”) will be the
goal….”.

Resilience and its encounter with architecture cannot be treated neither particular nor universal, but a paradigm. Resilience is thus is not a renunciation of identity, and its politics does not involve resignation, but, rather, a new form of political action. Pure singularities “have deposed all identity in order to appropriate belonging itself” (Agamben 1993:14) and opens the possibility for a whatever architecture as being as “it does not matter which” (Agamben 1993:1). The magic encounter between resilience and emancipation is then “empty space” where whatever singularities can communicate with each other without surrendering to the totalizing force of identity. This empty space, however, is not properly a physical or conceptual location or place, but is instead the experience of comparison and of a newly theoretical elaboration is taking-place. Resilience, as such, presents a potential character. It is in fact constituted by an infinite series of modal oscillations. Quodlibet, qualunque, whatever architecture is not to be understood as indifference, generality, or generic, but, rather, as being one such that it always matters.

As such architecture should "practicing dissensus", meaning should develop strategies and interventions that require political thinking and speech to activate new idea of order and new subjectivities and “becoming inoperative”, meaning acting in neutralizing its ordering forces and making it available for free uses: it would mean to return the practice itself to the everyday users of those spaces, and to discard the neoliberal exclusionary logic, which lately has created ‘alien’ environments and thus can open for a “radical inclusivity”3: a new common. In this respect, in re-discovering and liberating such encounters, their reflections represents an indispensable tool for architects in search of a theoretical and critical framework for a renewed political practice and a common use.

References
Notes

1 The intellectual apparatuses of this paper are emerging from an early work published as Boano and Kelling 2013, Boano, 2014 and Boano 2015, though major amendments have been provided in order to address the central aims of the conference and new research material has been included.


Values, Watersheds and Justification: On the handling of water in the urban landscapes of climate change

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ABSTRACT The aim of this paper is to articulate and present some arguments for the following main hypothesis concerning the handling of water (HOW) in the urban landscapes of our times of climate change. During industrialism water in urban areas to a very high degree was handled by ‘undergrounding’ it in systems of water provision, sewage systems etc. Under conditions of climate change this ‘undergrounding’ approach has shown its limitations. In extreme weather conditions water is ‘resurfacing’ which creates both problems and a new condition of HOW in urban landscapes. Problems of water cannot be ‘buried’ anymore; they also have to be handled at surface levels. This has two interconnected implications: firstly, watersheds gains new importance for HOW at surface-levels, and secondly, such surfacing of water problems leads to a rise in the potential levels of value-disputes and conflicts of interest concerning HOW. Together, this also hold potentials of achieving multiple benefits and action promoting resilience and liveability in urban landscapes. One way of approaching the value disputes is by asking if some conception of the common good in case of HOW can be justified at the same time as the plurality and diversity of values are recognised. Luc Boltanski and Laurent Thévenot’s concept of a plurality of regimes of justification – conflicting but also enabling compromise – gives an affirmative answer to this question which is exemplified in the final parts of the paper.

KEYWORDS: waterscapes; climate change adaptation; values; justification; diversity; urban landscapes; resilience; liveability.

Introduction

Current climate change projections (IPCC, 2014) indicate that climate change is likely to impact Earth on all scales and that taking action and implementing measures is becoming an increasingly urgent global matter of concern (UN, 2015). In the context of climate change also water is a pressing issue: too much water, too little water, too poor water or too uneven distribution of water. Thus handling of water (HOW) is highly important at many levels and scales: At overall level changes in waterscapes influence geopolitics, economies, governance and jurisdictional boundaries. At planning level water holds implications for different geographical scales and questions land-use and contemporary planning terms e.g. zoning usage classes, settlement patterns, infrastructures and divisions between the urban...
and the rural. At actor-level water pushes e.g. daily life practices, collaboration, responsibilities and use of materials. At a conceptual level, water challenges distinctions between nature-culture and even the notion of nature. Water thus has pivotal implications on many scales and levels, which are highly embedded in differentiating interests, values and practices. All of which is related to how we engage climate adaptation (CA), aim for resilience and which actions we choose. So how do we engage such vital waterscapes of uncertainty and the diversity of values involved?

This paper aims to deal with this complexity of questions by firstly providing a brief introduction to the recent history of HOW in Western Cities after the Industrial Revolution and how this might relate to water and values in the context of climate change and resilience. Secondly, current climate change and uncertain waterscapes is discussed in relation to jurisdictional boundaries through the lens of watersheds. Finally a methodological framework on how diverse values at actor-level can be engaged in a practice-oriented context by addressing justifications. The overarching aim is to engage resilience in urban landscapes in a practice-oriented manner through the means of waterscapes and diverse justifications. The overall hypothesis within the aim of this paper is formulated in the abstract. Before turning to the precise subject matter of the paper a few remarks about my overall research project within which the paper is located.

Research context

The aim of my research project is – in an exploratory manner – to discuss the ‘how to’ achieve multiple benefits in relation to CA and HOW in urban landscapes, searching to develop frameworks or modes of facilitation. The point of departure is the field of landscape architecture as seen from the concept of urban landscapes. The project uses mixed methods (action-research and research through design) including landscape architectural methodologies. This approach is deployed on real-time CA|HOW cases in a practice-based context. Cases are situated within the climatic context of Denmark where one of the challenges of CA|HOW is precipitation due to an increase in cloudburst. The findings and discussions on values and HOW are, however, also expected to be transferable to other waterscape contexts of climate change e.g. coastal cities facing sea level rise or areas facing droughts.

In the research project the concept of landscape architecture and urban landscapes is framed with a point of departure in Sieferle’s concept of ‘Total Landscape’ (Sieferle, 2004) which has been further elaborated by Martin Prominski (Prominski, 2005). Here, the concept of landscape is not defined by formal designs, fixed scales or planning distinctions. It rather covers a conglomerate of what is often called urban, rural and everything in between in a contextually based, process related manner: landscape is defined as continuously changing...
and formed by its processes, relationships and matters of uncertainty in specific contexts. Related to the uncertainties rising from climate change and changing waterscapes this approach to urban landscapes seems very useful. It holds the capacity to encompass both the physical properties and influences of water on, under/in and above terrain, territorial characteristics, spatial implications and process related influences and developments on different scales which too address human actions and impacts. This enables a cross-scale, cyclic-oriented approach with fluid boundaries. Like water itself!

**Historical outline: A few centuries of waterscapes in control**

Since ancient time human settlements show efforts to physically control water, e.g. the Grand Canal of China and Egypt’s irrigation canals. Nevertheless, to water the Industrial Revolution was the beginning of an era with large scale, systematized HOW at both the European and North American continents to an extent never seen before in the history of human settlement. The motivation was rooted in the massive population influx to urban areas resulting in an intensified and non-regulated use of water. This caused an array of water related problems like polluted drinking water and successive outbreaks of waterborne, epidemic diseases as typhoid and water cholera. The very water, which in itself had led to the specific locations of urban settlements moved from being a vital, culturally integrated and integrating matter to signalling itself as a threat.

![Fig. 1. Illustration “filthy father Thames”. Caricature published in `Punch´ on 21 July 1855, page 27. Source Wiki Commons.](image-url)
The upcoming acknowledgement of the concept hygiene formed important part of the measures to be taken and the solutions included separation of potable water and a formalized mix of black and grey water in underground systems. Led by remarkable engineering accomplishments water became a matter to be redirected, piped, pumped and drained. In many cases, e.g. N.Y., Vancouver and even smaller cities like Aalborg (Denmark), creeks and streams were also led underground. These efforts did relieve the problems with hygiene and spread of diseases, leaving former tangible and contextual implications of water invisible. As a side effect this development also provided the opportunity to settle differently and more freely. With water under control, proximity to water, topography and permeability were no longer determining human settlement. This highly influenced land-use and settlement patterns as it became feasible to settle in e.g. low-lying areas or even locations with a high groundwater table. The urban water challenges and solutions of this period formed the departure of a formalized command and control paradigm of water (Fratini, 2013). The labyrinthine mesh of underground piping represented a technological capacity, which apparently held no limits to its physical and geographical extent in both the urban and the rural.

Fig. 2. Settlement patterns free of considerations on water. Here reflected in toponyms with associations to water e.g. ‘willow-stream’, ‘pond’ and ‘reeds’. Lystrup town, Denmark, 2015. Photo by author.

Water-wise, the period from the Industrial Revolution until today can be seen as a utilitarian trajectory and waterscapes were in many ways disconnected from social and cultural life (Tvedt, 2014).

Today, these industrial underground waterscape practices are being challenged by uncertainties caused by climate change. With an increase in cloudburst events water is once again surface matter which questions values and priorities in relation to e.g. governance, planning and daily lives practices. Furthermore, changing waterscapes provides new conditions of HOW as water is a matter in constant flux which does not respond to interests or ‘fictional’ lines on a map.
Climate change and changing waterscapes challenge current practices and boundaries

Currently 54% of Earth’s 7.3 billion population is living in urban areas and by 2050 the urban population is projected to grow with another 2.5 billion (UN, 2014). If more extreme events occur as projected (IPCC, 2014), this is likely to put pressure on land-use, water politics and jurisdictional boundaries. In such future hybrid claims (Shannon, 2013) and conflict on values are likely to follow, some if which will involve surface solutions in urban landscapes. Water does act in readable patterns of flow based on topography, porosity, friction, evaporation and evapotranspiration, weather and groundwater flow. Nevertheless, Water does not acknowledge administrative boundaries like property lines and planning zones and acts without any concern of whether the spatial properties, the terrains, are ‘natural’ or human constructions. If waterscapes change, is it then, still possible to maintain divisions and collaborations based on planning distinctions like rural-urban, residential-industrial and the existing mesh of jurisdictional boundaries? Do we need to employ other approaches to values and boundaries in order to mitigate human interests and the right for living or even liveability?

Watersheds and disputes of value and interests

While the water management of the Industrial Revolution to a large extent left watersheds relatively unseen, the concept of watersheds is now (again) being used e.g. in national, regional- and urban planning. Watersheds and catchment areas can be seen as an appropriate and tangible way to engage water as a matter related to land-use, functions, processes and practices. Watersheds provide geographical divisions of land: water based territories (eco-system spaces of water)(Cohen, 2015), which to a large extent can be modelled and cartographically mapped out in visual, feasible ways and thus engage actors both physically and socially.

Fig. 3. Topographic mapping of sub-catchment area (approx. 6 km2) established before initiating climate adaptation and also used to define stakeholders. By courtesy of Aarhus Municipality, Denmark 2015.
As an example, this can be seen in recent planning practices of Seattle and Portland. Here, watersheds are identified and mapped as “visible entities” (Seattle.gov, 2015; Kingcounty.gov, 2015; SPU, 2015) and many HOW-projects engage solutions with multiple benefits on several scales (Rottle, 2015; Rottle, 2013), e.g. less polluted sound and rivers, survival of the salmon, traffic calming, safety, walkability, biodiversity, education, community gardening, local identity, citizen engagement, saving money and sewer capacity while diminishing the risk of combined sewer overflow.

Such engagement, however, includes both disputes, negotiation and collaboration in the creation of these values since diverse stakeholders is likely to represents diverse interests, e.g. individual house owners with considerations on parking spaces and front yard aesthetics, local communities, organisations, utility companies, municipality and up to a federal level of environmental protection where legislation forces action and change in practices.(EPA, 2015; SEA streets, 2015; Stewardship Partners, 2015).

In urban landscapes a watershed-approach will necessarily hold different implications at different planning scales, e.g. the single property, the street, the neighbourhood, the quarter and upwards which also relate to a diversity of values and interests. Thus for instance downstream residents with a risk of flooded houses are likely to have other concerns than upstream businesses with no flooding concern but concerns on keeping CA|HOW expenses low.

To develop a watershed approach at the scale of urban areas thus must include measures that afford the creation of cooperation out of conflicts of value and interests. One way of doing this is to rely on the liberal idea of ‘formatting’ personal attachments and interests as options of choice that are negotiable in the public realm (Thévenot 2010). Another way is looking for conceptions of the common good that are able to recognize the
existence of a plurality of values. In what follows this second road is investigated, not least because it at the level of values explicates some direction to actions and to bridging different values and priorities of actors involved.

Fig. 5. Diagram to exemplify cross-scale planning implications and watershed relations. By author.

Values, regimes of justification and water

If a watershed approach is engaged to retrofit current waterscape practices in the era of climate change, how do we then engage diverse actors in a practice-oriented context in order to render (visualize), negotiate and prioritize differentiating values? In one of my cases, I realized that in order to engage with the highly disputable concept of value and conceptions of multiple benefits, it was necessary to look into underlying principles of value. During meetings I experienced how argumentations rooted in e.g. hydrological calculations and jurisdictional boundaries collided with arguments based on citizen priorities and practices in the urban landscapes. The lines of arguments which I experienced seemed to hold legitimacy but they did not provide compatible valuation systems. This made it difficult to discuss and qualify which values to rely on to qualify decisions on CA|HOW actions.

This paper now proposes that the approach of Luc Boltanski and Laurent Thévenot to disputes concerning value principles in the context of justifying the common good is helpful
as a framework to engage practically with contextual-based diversities of values, precisely because it addresses more general principles of value underlying what is at play in concrete conflictual situations. Boltanski & Thévenot (2006) present a way of identifying and justifying values with their 6 Regimes of Justification: the inspirational, the domestic, the opinion, the civic, the market and the industrial regimes (Figure 6). These regimes can provide a methodological approach to clarify and discuss values, which also allows for mutual understanding, collaborative creation and help to reach for contextually based value priorities or compromises.

What seems particularly useful is that the framework provides contextual flexibility: actors are likely to represent more than one regime in the situation and it ‘allows’ that actors can shift justification (and thus regime) dependent on the context. Furthermore, the approach seems applicable in terms of collective (group) encounters, e.g. the department of a municipality, as well as individual encounters. This way, the regimes seem to hold the capability to ‘function’ as a scale-less and dynamic framework to engage values with specific stakeholders. This could be useful in order to facilitate value-based discussions between actors and thus promote co-creation and collaborative actions within the dynamic processes of HOW in urban landscapes.
Case experience on CA adaptation and plural values

In the following, I will look into one of my cases, an on-going CA|HOW project in a suburban town, from the perspective of justification. Here, the question of underlying principles of value surfaced, as I experienced how each actor involved, not only represented the interests and values of their specific department or sector, they also seemed to hold ‘patterns’ in their argumentations which seemed to derive from underlying justifications. In example, at one meeting a discussion came up about the specific location of a retention basin. This basin was to be located on a site in the urban landscape which in summertime also functioned as a circus field. This was not just a circus field: each summer the circus let their elephants run free in the neighbouring town forest, a big event in a small town. The project manager from the water utility company\(^3\) found these coinciding functions critical and brought up the discussion to relocate the retention basin by claiming, quote:” this is not good, this is an important and sensitive area to the citizens”. Whereas the project manager\(^4\) from the municipal Road & Traffic Department claimed (quote): “This is the best location: water has its flow – the circus wagon has to go”.

This led to a discussion where ‘best-location’, were argued by hydrological calculations, cost efficiency and administrative boundaries and ‘important-location’ were argued through citizen interests, involvement- and implementation processes. In the context of the meeting and its specific actor-project situation, both claims of best and important, indicated an embedded valuation of something holding a higher priority than the others argumentation AND both arguments seemed meaningful, justifiable and thus legitimate.

The arguments of ‘best’ location were based in numeric values such as costs, ownership and hydrological calculations stated as a ‘end-result’ of waters flow. From the departure of the regimes of justification, the arguments of ‘best’ location was rooted in the industrial regime providing calculability and measurability as proof of legitimacy and value. The arguments of ‘important’ location were rooted in local knowledge on the specific location and citizen behaviour, priorities and engagements. The arguments of the ‘important’ location could be seen as an actor taking in values from the civic regime related to processes, meaning and identity in their urban landscape.

What was actually the best or most important? Did any of the arguments hold more legitimacy than the others? Though hydrological calculations are based on careful measures, projections are still based on modelling tools, chosen inputs and upstream spatial decisions. As the circus is a free enterprise it could be questioned whether it in a longer time perspective would frequent this specific site to let their elephants run free – or if elephants as such are even allowed in circus in years to come.
So how can we engage disputes which use common denominators as best and important but nevertheless provide incompatible valuation criteria? This question seems likely to be transferable to elsewhere-situations of value-disputes on actions and priorities in urban landscapes. In this case, it appeared that in order to actively accommodate co-creation, it could have been useful to engage underlying principles of value.

The framework of the regimes of justification could have been used to pose questions as e.g. what kind of civic values is ‘desirable’? Could other civic values be provided? Could the acknowledgement of civic values have led to involvement of other actors? Do numeric based arguments in themselves hold enough value to solely rely on? Or could the involvement of not-represented values/regimes, e.g. the inspired regime, have been able to bring something else forward with the potential to bridge or push alternative solutions?

In order to engage with co-creation of multiple benefits in this specific actor-project situations, it seemed inadequate to merely engage in suggestive ways, e.g. to propose other potential values, thus adding further incompatible criteria to the dispute. Here, it seemed necessary to address underlying justifications of the actors before values and priorities could be discussed or negotiated beyond habit of thought, unspoken hierarchies and opaque practices. Firstly to provide clarity and acknowledgement to disputes, secondly to raise awareness of other regimes and their potential of collaborative value creation. In the context of this research project, the regimes of justification are to be further explored as a methodological framework to facilitate disputes and the creation of value and resilience in relation to CA in urban landscapes prompted by the new conditions of HOW.

Conclusion

After the Industrial Revolution water problems in urban areas were predominantly handled by undergrounding water infrastructures making them invisible to the general public. A labyrinthine mesh of underground piping represented a technological capacity, which apparently held no limits to its physical and geographical extension. From the point of view of the regimes of justification the HOW of industrialised cities seems to a high degree to have been legitimated as the common good by the value principles of the industrial regime of justification (efficiency and prediction) in a not very troublesome compromise with the civic regime (promoting the health of all citizens of the city). Here one might speculate that precisely the material hiding of water problems was a condition of possibility of this compromise.

In current conditions of climate change and extreme water situations this condition of possibility doesn’t work anymore. Water problems have surfaced, watersheds have gained new importance, which criss-crosses existing technical, juridical, planning, political and everyday practical boundaries. With water problems materially surfacing the potential level
of conflicts of interest and value as well as difficulties of compromise increase. In this situation the conceptual apparatus of regimes of justification seems particularly helpful in articulating the principles of value behind many disputes and thus also of finding ways of handling them in the new water contexts. Watersheds are physical entities with physical matter and properties, which dissolve jurisdictional boundaries and can be approached as eco-system spaces that hold the capacity of inducing diverse actors to negotiate their options. However, this in itself does not necessarily promote agreements or actions with long-term perspectives. Here the 6 regimes of justification might hold potential as a framework aiming to promote context-specific discussion and negotiation with also longer-term perspectives focalised on compromise for the common good. In combination with the notion of watersheds, this could be an entry to support value-based collaboration and cross-scale measures with both short- and long-term perspectives when adapting to waterscapes of uncertainty, aiming for resilience and liveability.

References


IWA Publishing. Water Science & Technology. 66.11.


**Notes**

1 The concept of watersheds, sub watersheds, drainage basins and catchment areas etc. relates to different (but not fixed) interconnected geographical scales: from the continental divides down to smaller catchment areas around a creek. For the sake of simplification I shall in this paper use the term watershed covering both sub-watersheds, catchments areas, etc. Of course the terms relate to many other implications and discussions, but this is beyond the scope of this paper. The common denominator emphasised here is that both large watersheds and smaller catchment areas show specific interdependencies e.g. up- and downstream relations, where upstream usage, conditions and actions highly influence downstream situations.

2 I am aware that Thévenot has proposed the existence of a 7th ecological regime of justification (Thévenot et.al. 2000). This proposition will be taken into consideration in my further work.

3 Please note that this actor actually represented the utility company which holds both justifications from both the industrial regime (accountability, water quality), the civic (clean water, avoiding CSO, fair prices) and the market regime (company’s XXX).

4 Actor names are known to the author.
Session 4

Strategies for Mitigation
The PassivHaus Standard: Minimising overheating risk in a changing climate

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ABSTRACT Building operational energy is responsible for approximately 40% of UK’s CO₂ emissions (GOV.UK, 2014) with almost 25% in housing alone, mostly for space heating. This significantly contributes to climate change, which is now considered unavoidable (IPCC, 2013) and could affect occupants’ thermal comfort and health (Public Health England, 2013). Given that our buildings are built for 50–100 year lifespans (de Wilde et al, 2008), measures to adapt our buildings to a changing climate need to be undertaken alongside climate change mitigation strategies.

This paper investigates the risk of overheating and the remedial measures required for future UK climate scenarios if the PassivHaus standard is applied.

A case-study dwelling was modeled and its performance assessed under present and future climate scenarios in London: 2050s and 2080s for a Medium and High emissions scenario. Findings indicated that while space-heating demand would be reduced by 45% by the 2080s, the case-study dwelling is likely to need some form of cooling from the 2050s onwards, unless passive adaptation measures are put in place. The most effective adaptation measure was found to be a combination of reduction on the glazing’s g-value, summer night-time natural ventilation and solar shading.

The performance of the Building Regulations (2013) notional specification highlights that while it is predicted to lead to marginally lower overheating frequencies than the PassivHaus dwelling, its space heating demand will be up to five times higher in the 2080s. Hence measures for reducing space heating demand alongside measures to reduce future overheating are both necessary and need to be balanced. Findings indicated that the PassivHaus case-study performed well in a future changing climate if this goes hand in hand with overheating mitigation measures, taking into account user behaviour and occupancy patterns, applied now and in the future.

KEYWORDS: Climate change; building overheating; PassivHaus; low-energy housing.

Introduction

The building sector is responsible for ~30% of global greenhouse gases, from which 80% are generated through the operational energy consumption in buildings (UNEP, 2009). In the UK, building operation is responsible for ~40% of energy use (GOV.UK, 2014); the majority of energy use is in housing and is for space-heating. A changing climate is considered unavoidable (IPCC, 2013) and average future projections for the UK indicate milder and
wetter winters, hotter and drier summers and an increase in both the temperature of the warmest day in summer and in the precipitation rate of the wettest day in winter (UKCCRA, 2012). Since buildings have a long lifespan (de Wilde et al, 2008), climate adaptation measures will need to be considered alongside climate mitigation strategies.

The purpose of this paper is to identify and balance both climate change mitigation measures with adaptation strategies by evaluating future climate change scenarios of a low energy building standard - the PassivHaus standard - compared to the current Building Regulations standard with the aim to assess the robustness of both standards in a future changing climate. The research results presented in this paper were derived by analysing and applying adaptation measures to a PassivHaus case-study located in the UK.

**Methodology**

*Case-study: dwelling assessed*

The studied dwelling is a 2010 certified PassivHaus located in Denby Dale, West Yorkshire. The building is a 118 m² two storey detached house characterised by cavity wall construction filled with fibrous insulating material and covered with natural Yorkshire stone. The U-values of the main construction elements are presented in Table 1. At present, although no significant overheating risk occurs (6% of the occupied year over 25ºC), solar radiation is controlled with a roof overhang on the south elevation as well as vertical external solar blinds, protecting the double storey glazing on the south and west elevation.

**PassivHaus Planning Package (PHPP 2007) model**

The authors obtained the PHPP model for the case study; however the latter blinds were excluded from the original PHPP model and were therefore also excluded as a starting point. The case-study dwelling was modeled in the Leeds climate, which was the nearest climate data set available for the actual case study’s location. Several other UK locations (Belfast, Edinburgh, London and Cardiff) were also modeled, of which London showed the highest overheating frequency, hence the justification to use London as the focus of this paper.

A disadvantage of PHPP is that since it is not a dynamic model, it considers the whole building as one zone for energy and comfort calculations. Without thermal zoning of separate rooms, possible overheating could occur in certain rooms but would not be identified by the model, therefore different room orientations or locations could not be investigated in this paper. Additionally, modeling of thermal mass was excluded due to PHPP’s monthly or yearly instead of daily analysis. It is also acknowledged that user behaviour and internal heat gains from appliances can significantly affect dwelling overheating risk as noted by Ridley et al (2014), but has not been studied here. Ridley et al (2013) reported PHPP to be a good predictor of overheating risk compared to monitored
summer data, though PHPP did appear to underestimate the actual risk for the Camden PassivHaus. For the same dwelling, monitored data indicates that overheating risks can vary in different rooms, from year to year and are also occupant dependent (bere: architects, 2014) – none of these variables were studied here.

Future climate projections and current climate data

Future UKCP09 Prometheus data was used to model future climates in the 2050s and in the 2080s under Medium (MeES) and High (HiES) emissions scenarios due to the fact that globally we are on a trajectory of medium to high emissions scenarios (Nakicenovic et al, 2000). TRYs data with 50% probability was utilised as there is equal probability that this climate scenario is exceeded or not and considered suitable for assessing a mean weather year and as per other research conducted, for example by McLeod et al (2013).

The Prometheus data excludes vertical radiation data; hence current radiation data was used. BRE Central London data was used for current climate data.

Evaluation of the performance of the case study dwelling

To investigate the robustness of the PassivHaus standard compared to the Building Regulations standard, the case-study dwelling was modeled in PHPP to meet the PART L1A (2013) notional dwelling’s building fabric, with higher U-values and air permeability; as listed in Table 1. The dwelling’s performance is assessed by evaluating its space heating demand (kWh/m²a) and its overheating frequency (%) under the current climate and different future London climate scenarios. The PassivHaus standard stipulates a space heating demand of maximum 15 kWh/m²a and that a building overheats when its internal temperature exceeds 25°C more than 10% of the occupied year². For this reason these limits are used to assess the robustness of the PassivHaus standard in different scenarios.

The overheating criterion recommended by the PassivHaus standard is less lenient than the equivalent CIBSE (2006) benchmark for summer peak temperature in the UK, which is set at 1% of the occupied year over 28°C in living spaces and 26°C in bedrooms.
Table 1. Case-study fabric U-values (W/m²K)/G-values and Part L1A notional dwelling specifications.

<table>
<thead>
<tr>
<th>Element or System</th>
<th>Values of the PassivHaus dwelling</th>
<th>Values of PART L1A (2013) notional dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof U-value</td>
<td>0.096 W/m²K</td>
<td>0.13 W/m²K</td>
</tr>
<tr>
<td>Wall U-value</td>
<td>0.112 W/m²K</td>
<td>0.18 W/m²K</td>
</tr>
<tr>
<td>Floor U-value</td>
<td>0.104 W/m²K</td>
<td>0.13 W/m²K</td>
</tr>
<tr>
<td>Window U-value/ Glazing G-value</td>
<td>0.96 (glazing) W/m²K; 0.6 W/m²K (frame) / 0.51 or 0.53</td>
<td>1.4 W/m²K / 0.63</td>
</tr>
<tr>
<td>Glazed Door U-value/ Glazing G-value</td>
<td>0.92 (glazing) W/m²K; 0.6 W/m²K (frame) / 0.51</td>
<td>1.4 W/m²K / 0.63</td>
</tr>
<tr>
<td>Airtightness</td>
<td>0.33 aach at 50 Pa</td>
<td>NATURAL VENTILATION</td>
</tr>
<tr>
<td>Type of Ventilation</td>
<td>MVHR</td>
<td>NATURAL VENTILATION</td>
</tr>
</tbody>
</table>

Overheating mitigation measures

To prevent overheating, 11 passive overheating mitigation measures, which can be applied now or in the future, were tested for the PassivHaus dwelling and are presented in Table 2, ordered according to their easiness of installation and their relative independence of occupant control (i.e. easiness of use). These measures are based on CIBSE TM55’s recommendations (CIBSE, 2014) and those included by other studies such as Collins et al (2010) and Mavrogianni et al (2014). Seven of the eleven measures are shading devices which are evaluated according to their different shading coefficients\(^3\), location (internal/external) and material reflectivity. External shading devices have the advantage of reducing solar radiation before entering the spaces (European Commission, n.d.), leading to a low shading coefficient (Olgyay, 1963) – see Table 2.

Table 2. Overheating mitigation measures individually applied to the PassivHaus case-study.

<table>
<thead>
<tr>
<th>Easiness of use</th>
<th>Easiness of installation</th>
<th>Adaptation Measures</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>√</td>
<td>√</td>
<td>Lower glazing g-value</td>
<td>Reduction of the glazing’s g-value from 0.53 and 0.51 to 0.36</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Summer night-time natural ventilation</td>
<td>First floor operable windows assumed partly open; Ground floor windows assumed closed; Single ventilation</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: Dark grey curtains</td>
<td>Shading Coefficient 0.58 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: White curtains</td>
<td>Shading Coefficient 0.40 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: Internal dark rollers</td>
<td>Shading Coefficient 0.81 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: Internal white rollers</td>
<td>Shading Coefficient 0.41 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: Internal dark blinds</td>
<td>Shading Coefficient 0.75 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: Internal white blinds</td>
<td>Shading Coefficient 0.56 (Olgyay 1963)</td>
</tr>
<tr>
<td>n/a</td>
<td>√</td>
<td>Shading in summer: External white-cream blinds</td>
<td>Shading Coefficient 0.15 (Olgyay 1963)</td>
</tr>
<tr>
<td>√</td>
<td>n/a</td>
<td>Double glazing instead of triple glazing</td>
<td>Increase of U-value from 0.6 to 1.1 W/m²K</td>
</tr>
<tr>
<td>√</td>
<td>n/a</td>
<td>Increase of roof overhang’s depth</td>
<td>Increase of roof overhang’s depth (south elevation) from approximately 1 m to 1.5 m.</td>
</tr>
</tbody>
</table>
Results and discussion

Case study performance over time

The overheating frequency and the space heating demand of the PassivHaus case-study are illustrated in Fig. 1 and highlights that the space heating demand follows a downward trend over time. By the 2080s (HiES), the space heating demand of the case-study is predicted to drop by 45%. Even in a warming climate there will still be demand for space heating, as also reported by McLeod et al (2013) and by Collins et al (2010).

However, overheating is expected to be a more regular occurrence, likely requiring cooling from the 2050s, unless remedial measures are put in place: overheating frequency is expected to increase from 6% at present to 31% by the 2080s (HiES) for the PassivHaus dwelling (Fig.1) and from 4% to 27% by the 2080s (HiES) for the PART L1A notional dwelling, which will see a 36% drop in space heating demand.

The results suggest that while the notional dwelling is expected to overheat slightly less than the PassivHaus, both standards will require remedial measures to reduce summer-time overheating. Similar trends were also observed by for example McLeod et al (2013) and Mavrogianni et al (2014); and Crawley (2008); though the exact space heating demand, overheating risk and when it occurs differ as they are based on different cases, types of buildings and different locations and due to different future weather data (type, scenario and probability) used. Using the CIBSE (2006) 26ºC and 28ºC overheating threshold, for London...
in the 2080s (HiES), there would still be a 23% and 15% overheating frequency respectively during occupied hours4.

PassivHaus dwelling adaptation to a future changing climate

The impact of the 11 overheating mitigation measures (as set out in Table 3) on annual space heating demand and on overheating frequency is presented below and highlights that the reduction of the glazing’s g-value alone results in a significant decrease from 31% to 19% in the overheating frequency (both 2080s, HiES), a drop of 39% relative decrease. Glazing often requires replacement after 10-15 years (European Commission, 2010), so future window replacements with lower g-values would enable occupants to save money, while doing it in the future would not reduce beneficial winter solar gain at present.

Summer night-time natural ventilation is a cost-free measure which does not affect the space heating demand, however on its own its impact is limited to reducing overheating frequency from 31% to just 26% in the 2080s (HiES). McLeod et al (2013) also reported on the inefficiency of night-time ventilation as a sole means to eliminate the overheating risk. However there may be an increased effectiveness of night-time ventilation in the future due to the Urban Heat Island (UHI) due to a possible increased diurnal temperature range (Demanuele et al, 2012). Additionally, night-time ventilation should also be carefully designed due to security and urban noise risk (Mumovic and Santamouris, 2009) and for these reasons this study assumed that the windows of the first floor were kept partly open (tilted) but not cross ventilated (doors closed between rooms) and closed on the ground floor.

Summer shading is intended as a temporary summer measure, which does not affect winter space heating demand and - depending on the shading type and reflectivity - it has the potential to reduce the overheating frequency below the 10% boundary if installing external light-coloured blinds; eliminating the projected overheating risk by the 2050s entirely and to reduce its frequency below 10% by the 2080s. These findings are in line with other studies carried out, for example by McLeod et al (2013). External light-coloured blinds are the only intervention which on their own might reduce overheating frequency to below 10% by the 2080s (HiES). Significant overheating frequency reductions are also achieved by installing internal white curtains or white roller blinds and their use reduce the overheating frequencies below 10% with the exception of 2080s (HiES), when its predicted overheating frequency is expected to exceed 10%.

As expected, the least effective summer shading devices were the internal dark rollers and blinds, though they still reduce overheating frequency significantly: 26% and 35% relative reduction in the 2080s (HiES) respectively.
Increasing the roof overhang depth of the south elevation was also investigated, however as expected this does not reduce the overheating frequency significantly: still 27% overheating frequency in the 2080s (HiES). This is because its depth is limited by structural limitations but also to allow winter solar gain over time, leading to a small predicted additional space heating demand. Due to the structural difficulty and expense, its installation during the building’s initial construction is advocated rather than at later stages.

Finally, the replacement of triple glazing by double glazing drops the overheating frequency from 31% to 27% in the 2080s (HiES). However, the present space heating demand exceeds the PassivHaus criteria of 15 kWh/m²a by 3 kWh/m²a until about the 2050s, when such measure may be an effective measure.

Alongside the 11 adaptation intervention measures, the impact of orientation was also briefly investigated with the aim to understand whether designing for winter solar gain (i.e. facing south) would still make sense in a future changing climate. As expected, overheating frequency is reduced by 11% from 31% to 20% (both 2080s, HiES), when the main living spaces are north-facing, but this is offset with an increased winter space heat demand of 72% or 8 kWh/m²a at the present time. A similar model highlighted that an east-facing façade reduced overheating frequency from 31% to 28% (both 2080s, HiES), but leads to a 6 kWh/m²a increase in space heating demand today. This indicates that future building design and building solar orientation may be more beneficial facing north instead of south.

Comparison of two actual monitored PassivHaus dwellings in Wales reports that the dwelling with increased south-facing glazing overheated more significantly (Ridley et al, 2014).

**Combined adaptation measures to mitigate overheating risk in a future changing climate**

Of the 11 overheating mitigation measures, the reduction of the glazing’s g-value, summer night-time natural ventilation and summer shading are the most effective measures at preventing overheating in a warming climate while relatively easy to install. However only external light-coloured blinds could solely eliminate the overheating frequency (and hence the likelihood of active cooling).

For the use of blinds and night-time natural ventilation to be effective, occupant behaviour is important (such as lowering/opening/closing the blinds and windows) (Mumovic and Santamouris, 2009). However, it cannot be controlled for or predicted by designers. One solution could be the installation of automatically controlled windows and shading devices, such as in the Camden PassivHaus (bere: architects, 2011). However, complicated control systems should be avoided - especially in dwellings - in order to be easily operated by occupants (Bordass, Bromley and Leaman, 1993).
It is therefore considered more robust to propose a combination of measures to reduce overheating frequency. For both standards, the combination of the reduction of the glazing’s g-value, summer night-time natural ventilation, alongside a mixture of solar shading (internal/external, all light-coloured) indicate that the overheating frequency could be eliminated by the 2050s and reduce it to < 5% by the 2080s.

Conclusion

This paper highlighted that the use of PassivHaus standards is likely to increase the frequency of overheating over time by 30% (absolute increase), whereas space heating demand is anticipated to follow a downward trend, [45% reduction by 2080s (HiES)], but not reduced to zero.

Taking effectiveness at reducing overheating frequency and easiness/cost of the overheating mitigation measures into consideration, the reduction of the glazing’s g-value, summer night-time natural ventilation and summer shading are the most effective measures to reduce summer-time overheating. Only external light-coloured blinds could reduce future overheating frequency significantly (2080s, HiEs), however the combination of these three measures could reduce overheating below 5% for both studied standards: PART L1A (2013) and PassivHaus. While the Part L1A (2013) notional dwelling is slightly more robust in terms of overheating [3% versus 4% overheating in 2080s (HiES)], its future space heating demand is about 4 times higher than the PassivHaus standard. The balance of both space heating energy use and overheating frequency over time, appears to be significantly more energy efficient now and in the future for the PassivHaus standard, indicating the efficacy of highly insulated and airtight dwellings to reduce energy use, even in a warmer future climate, as long as this goes hand in hand with some remedial measures applied now and in the future; such remedial measures will also be required for other building standards.

Note that the case study’s performance described above is likely to differ from the building’s actual performance. Even if buildings are designed to be comfortable, occupant behaviour is likely to affect their performance while modeling limitations and overheating criteria should be taken into consideration. Dynamic energy modeling and testing of (a.) different overheating thresholds; (b.) different user assumptions in models versus actual behaviour (c.) impact of internal heat gain from appliances and (d.) the effectiveness of thermal mass combined with night-cooling are recommended for further research.
References


**Notes**

1 For a PassivHaus dwelling, an occupied year is perceived to be 365 days a year (BRE n.d.).

2 ibid

3 In line with CIBSE Guide A, shading coefficient is “the ratio of the instantaneous heat gain at normal incidence transmitted by a particular glass/blind combination to that transmitted by a reference glass, usually 3 mm or 4 mm thick clear glass” (CIBSE, 2006).

4 The overheating frequencies derived by using the CIBSE thresholds were estimated by assuming an occupied year to be 365 days a year (BRE n.d.) to allow for comparison with the Passivhaus threshold.
ABSTRACT Aiming to provide novel forms of resilient architectural solutions, the emergent building's typology undertakes the features of property-changing materials, structures with instinctive behavior and ecological optimization. Thus, architectural research has leaned toward scientific and technological breakthroughs, addressing concepts of self-generating morphologies, adaptive, responsive, and intelligent behavior. Raising environmental awareness and the increasing frequency of natural hazards striking in densely populated zones stand behind these emergent solutions. At Biotectonica Research and Design Studio of the School of Architecture of the Pontifical Catholic University of Puerto Rico, we have fabricated a weather-sensible facade prototype for Puerto Rico's climate, where rain fall is very common and extreme weather events such as hurricanes are frequent. Inspired by the multi-material complexity of nature, the design takes advantage of property-changing metals and woods that combine in order to react to variations in temperature and relative humidity, thereby, adapting in real-time to the changes of the tropical weather. Responsive facades are not the only technologies framing the future resilient tectonics. Intelligent architectures will be also embedded to the very concept of the structural layout. Inspired by the morphology-changing features driven by the instinctive behavior of vertebrate animals, we designed a novel solution to the earthquake's hazard in the Caribbean. Building's skeletons with pre-designed movements were proposed based on the way that vertebrate animals instinctively reacts under external inputs to maintain balance. These structures can trigger certain fixed action patterns under definite motion stimuli in order to improve the architectural resilience. A built environment with instincts will be the next frontier of truly resilient architecture. This science of cognitive tectonics takes advantage of emergent technologies to foster optimum ways of resilience inspired by the living beings.

KEYWORDS: cognitive tectonics, structural resilience, property-changing material, responsive architecture, smart building, biomimicry.

Introduction

Buildings are meant to be considered by humans as intelligent agents. This intelligence dimension diverts from the concept currently designated for smart buildings, which usually relates to integrated building systems (Sherbini & Krawczyk, 2005). The proposed concept rather mimics specific parameters of the cognitive spectrum of certain life forms. An instinct is a complex sequence of reflexes considered as lapsed intelligence by some animal
psychologists (Herrnstein, 1972). Despite the theoretical anxieties about instinctive behavior and intelligence, the fact is that the instincts are part of the cognitive biology of most living beings concerning their resilient behavior. Building's instinctive behavior, therefore, draws the last frontier in the evolutive development for resilient architecture.

The term resilience derives from psychology to measure the ability of patients to recover from stress or depression. Architectural resilience is strongly related to the definition stated by material engineers as the capability of certain materials to recover from stress and adapt to sudden inputs (Addington & Schodek, 2005). Raising environmental awareness and the increasing frequency of natural hazards striking in densely populated zones stand behind the emerging concerns of resilient design. Due to their instinctive responses, some animals show resilient behavior during conditions which are analogous to those generated by important natural hazards. Bees, roaches as well as some birds can foresee weather patterns by sensing changes in temperature and relative humidity. Accordingly, they instinctively adapt their behavior in order to protect themselves. Besides, most vertebrates such as dogs, cats and even humans, instinctively reacts to different types of load by adapting their morphology in order to keep their balance. Some of these loads are analogous to wind gusts while others can be compared to seismic motion. At Biotectonica Research and Design Studio at the School of Architecture of the Pontifical Catholic University of Puerto Rico we drew inspiration from these two different biological instincts to design architectural parameters that improves building's resilience during hurricanes and earthquakes.

Natural Hazards in the Caribbean

Puerto Rico is an archipelago located in the Caribbean. With a tropical climate, Puerto Rico's history has been shaped by many weather events, some of them extreme, such as storms and hurricanes. Hence, atmospheric conditions figure as important concerns for architectural resilience. On the other hand, Puerto Rico is located in a highly active seismic zone (Fig. 1b, 1c). Like most countries around the globe, concrete is the main construction material in Puerto Rico, which is not exactly the most resilient material during earthquakes.

Biomimetic Solutions

In order to propose optimum resilient designs, we have questioned how buildings should react to all these geographical factors to adapt accordingly just like the living beings would do it. How do buildings must adapt to wind gusts from strong hurricanes, or to lateral loads produced by major earthquakes? How does concrete should behave in order to be truly resilient during seismic motion? How might change our architecture in order to improve adaptation to weather variables? Some answers have been found mimicking the responsive
abilities of the living beings. First, taking advantage of the adaptive instincts from local wildlife, we have fabricated responsive prototypes able to sense and react to multiple atmospheric conditions. On the other hand, we have matched corporeal responses with external stimuli that recreate the different motion that affects buildings in Puerto Rico. How does our bodies respond to wind type of loads? How our body does instinctively adapts to ground cyclic motion? Finally, we have identified a natural counterpart to concrete aiming to optimize this material mimicking nature's evolved resilience. Our goal is to program all these bio-inspired resilient parameters into the behavior of the next generation of buildings.

Fig. 1. Puerto Rico located in the Caribbean context (a) within a zone of multiple natural hazards, (b) surrounded by seismic faults, (c) subjected to dozen of tremors a month, and (d) susceptible to the path of tropical cyclones.

Weather-Sensible Structure

Puerto Rico is located within the tropical climatic zone. In tropical climates, seasonal variations are dominated by precipitation from diverse atmospheric events. These events can range from tropical waves, tropical depressions and even stronger events such as tropical cyclones (Fig. 1d). In fact, the hurricane season in Puerto Rico stretches from June 1st into November 30th. Thus, with a rainfall that averages from 745 mm up to 4346 mm a year, precipitation is a very frequent event for people in Puerto Rico and is deeply rooted to its architecture. Diverse species from wildlife in Puerto Rico demonstrate keen adaptability
features to this climatic zone. For example, birds, bees and roaches are able to sense and instinctively adapt to certain environmental variables in advancement of rainfall.

**Birds and Heterothermic Insects**

Studies have proved through experimentation that birds can predict changes in the weather by reading the rise and fall of barometric pressure (Breuner et al., 2013). Barometric or atmospheric pressure is affected by both temperature and moisture. Even though birds are actually capable of measuring the interaction between temperature and moisture in the air, there is not definite evidence about their mechanism. However, insects have been lot more studied and there is a great variety of them adapted to the climatic conditions of Puerto Rico. Bees and roaches are highly susceptible to changes in ambient temperature and humidity because they are heterothermic which means that, different from birds and mammals, their body temperature varies with the environment. Aiming to translate the biological mechanism that triggers the meteorological adaptation, we studied both specimens at the laboratory. The microscopic analysis let us observe the sum of parts composing this sensorial feature. For example, we were able to conclude that the roach feeler (Fig. 2a) resembles the properties of wooden layers which expands with moisture and contracts when dry. Bee's antennae also has receptor cells that combine with the muscles to anticipate and respond to the fluctuation of temperature. A very important parameter that we were able to observe was the wide variety of densities, arrangements and constitution from these biomaterials.
Responsive Architectural System

Matching the responsive abilities from the biological materials that constitutes the bodies of the bees and roaches was an exercise of matching these biomaterials mechanical properties with those of existing man-made composites. We concluded that the fittest materials for performing like the biological counterpart were nitinol bimetal plates and wood veneer sheets. Due to the mechanical properties of its atomic structure, nitinol alloys exhibit responsive behavior upon heating (Addington & Schodek, 2005). On the other hand, wood veneer fibers absorb water from the air making the composite responsive to the fluctuation of humidity. Thus, we prototyped a multi-material skin able to change its own morphology in reaction to both temperature and humidity (Fig. 2b, 2c), which are the two main factors of barometric pressure. Just like any bird within the tropical climatic zone, a building wrapped with this biomimetic skin, might be able to anticipate precipitation and adapt accordingly. But atmospheric events are not the only ones threatening the resilience of buildings and cities in Puerto Rico. Within a highly active seismic zone, earthquakes are the most dangerous natural hazard for the islands in the Caribbean.

Seismic-Resilient Structure

Unlike weather, seismic activity is very difficult to anticipate. The Caribbean has proved to be susceptible to this natural hazards. In 2010, more than 100,000 people died in the 7.0 Richter-scale earthquake in Haiti, an island next to Puerto Rico. Surrounded by tectonic faults, Puerto Rico is also vulnerable to the effects of tremors. Every year, more than 600 seismic events are detected by the Puerto Rico Seismic Network, though only a few of them are actually experienced by the population. The fact is that lateral loads are also part of the architectural daily basis in Puerto Rico, which in 1918 suffered its most significant earthquake and tsunami that killed 116 people. Because buildings are conceptualized as static objects, their resilience relies on the material properties of their structures (Mendez, 2010). From biological models we concluded that optimum resilience relies not only on the material properties of the structure, but also on its kinetic features following instinctive behavior.

Laboratory Experiment

Animal psychologists agreed that instincts are complex sequences of reflexes (Herrnstein, 1972). Reflexes are involuntary movements or reactions preprogrammed in the physiology of organisms concerning their survival and adaptation. Instincts can be triggered in a purely mechanical fashion from the musculoskeletal system of organisms to improve their structural resilience. At the studio, we investigated the instincts of some domestic
animals such as cats and dogs. The same way a cat falling from a treetop always performs the same sequence of movements to land on foot, other animals such as dogs draw specific chains of actions to balance their bodies when subjected to horizontal movements analogous to seismic lateral loads. At the studio we concentrated on cats, dogs and humans. In order to define a clear observational correlation, we subject the three specimens to the same input: ground cyclic motion. Surprisingly, all of them perform almost exactly the same sequence of actions. Based on video analysis, and diagraming the different frames from the sequence we were able to identify at least three fundamental steps: (1) the sequence of reflexes starts by opening the legs for expanding the surface area, (2) almost simultaneously the subject lowers their body lowering the center of gravity to improve equilibrium, and finally (3) the subject opens the arms to add a balance feature. We observed that if the stimuli continues and intensifies, the subject continues to improve its reaction not by changing or adding new responses but by amplifying the originals. The cat and dog continues to lower their bodies until their belly reaches the ground and, thereby, maximizing the surface area. Humans also continue to lowers their center of gravity until their body forms a kind of tridimensional bracing system between legs and arms. Doing this, all three specimens decrease the effects and intensity of the lateral loads produced in their bodies due to the horizontal motion. Based on this instinctive behavior, at the studio we conceptualize the algorithm on resilient behavior for architectural structures. We modeled a high rise building with a preprogrammed sequence of reflexes inspired by those actions previously analyzed at the studio (Fig. 3). These preprogrammed reflexes were designed to trigger when the structure senses lateral loads. The proposed structure was designed taking advantage of property-changing composites or smart materials.

**Architectural Structure with Instincts**

Starting from the typical rectangular urban shape, we designed a vertically-proportioned building. Rigid slabs were accommodated at a constant distance throughout the full height. Then, a regular system of columns was attached to the surface of the tower, drawing a vertically tessellated envelope. That columns were conceived based on a property-changing material with piezoelectric effect (Ionov, 2013) able to transform the envelope from a typical grid-slab system into a diagrid. Special kinetic features inspired by the biological counterpart analysis were considered to minimize the drift. The action of opening the legs was translated into a responsive element positioned at the structure base. This element turns into an arc that channels the load from the ground and thus minimize base shear. Then, the rectilinear envelope morphs into a diagrid to reduce the structure drift. The diagrid stiffens up the building and also channels better the lateral loads produced from the top to the ground. This envelope is attached to the ground, therefore, when it turns into a diagrid, simultaneously the
building height decreases by 3%. Taking advantage of computational analysis, we have been able to measure the efficiency of this pre-programmed instinct and each of its steps. Though still a work-in-progress, we aim to define the basic algorithm for building’s resilient behavior closely related to the cognitive actions of the living beings.

Fig. 3. Bio-structural translation of the instinctive action sequence from dogs and humans subjected to lateral loads into an architectural set of kinetic actions (M_0 to M_f) for the envelope grid and base.

**Seismic-Resilient Concrete Bones**

Another project we have been working on concerning the resilient behavior of structures relies on materiality, especially concrete structures. Concrete is the most widely used construction material in the world. Although concrete technology has improved and its mechanical properties are getting better, concrete’s resilience still lies on the unnatural paradigm where the structural performance relies almost completely on the material properties (Mendez, 2010). In contrast, living structures such as the human bones intertwine the material properties with the structural morphology in order to improve resilient behavior.
*Building’s Skeleton made of Concrete*

We designed a special moment resisting frame of concrete inspired by this biological parameter of structural performance. Biological morphology always performs a structural function (Lim, 2009). According to the Wolff’s Law, bones are shaped by the accustomed loads to which they are subjected. The proposed special moment resisting frame of concrete was designed inspired by this principle of growth. Instead of the normal inputs of biological growth, the biomimetic design for the concrete frame relies on the inputs produced by seismic loads. Hence, each concrete element was shaped by the seismic loads and therefore adapted to that kind of motion. Using ETABS v.8 and SAP2000 we analyzed the structural performance of the biomimetic non-prismatic concrete frame and find that it was stiffer than the typical concrete frame (Fig. 4). Moreover, the concrete employed was greatly reduced because, like the bone, the material was removed from locations where does not perform a structural function.

![Fig. 4. Preliminary Finite Elements (FE) analysis with ETABS of the bio-structural frame of concrete demonstrate reduced drift than the typical Special Moment Resisting Frame (SMRF) of concrete subjected to the effects of lateral loads (100 kips) produced by seismic motion](image-url)
Conclusion

The future of resilient design lies on the intelligence of the living beings which is embedded from their physiology to its behavior. At Biotectonica Research and Design Studio we have explored such diverse dimensions of biological intelligence in order to define a whole new building's tectonic based on resilience. Inspired by the cognitive biology of birds and insects we have designed a multi-material prototype able to sense and respond to weather. Taking advantage of instinctive behavior of certain organisms to maintain their structural equilibrium we have devised a smart structure able to instinctively adapt its morphology to seismic motion. Having identified a biological counterpart for concrete structures we have been able to improve the mechanical outcome of this structural material. From weather-responsive facades, seismic-adaptive structures and biomimetic concrete morphologies, the tectonic experience of the future might be shaped by the parameters of intelligence in nature and the living beings. This reliable scenario puts buildings in a whole new level where they are no more just inert structures but will rather be considered as intelligent agents.

References


ABSTRACT At the Solar Decathlon Europe 2014 (SDE2014) competition (Versailles, France), the team from the Delft University of Technology (TU Delft) took a stance by not constructing a new-built house but demonstrating the energy renovation of a typical Dutch terraced house. Around a quarter of Dutch housing consists of terraced houses built between 1946 and 1975, which have a poor energy performance, endure moist and mould problems and to modern-day standards offer too little living space. Nonetheless, inhabitants cherish these homes; almost everyone in the Netherlands once spent a part of their life in them.

The TU Delft team chose a real house as the reference for their retrofit design, the home to one of the students’ grandfather and father, currently vacant. All actual features, unfavourable as they are, were taken as the basis: few existing houses are optimally designed for energy neutrality. The team worked on a gentle plan that enables inhabitant to stay in the house during intervention. Hence the name Prêt-à-Loger, ready to live in.

Basis of the Prêt-à-Loger concept is a new skin around the house: thermal insulation in the façade and roof, a greenhouse structure to the south-east, and phase change materials in the crawlspace. The smart and bioclimatic design ensures the use of local circumstances, optimised by an intelligent application of modern technology.

The eye-catching feature, the greenhouse, integrates several elements of the house’s climate design. Its greatest importance however lies in the added value to the dwellers: in spring and autumn it can be used as living space, in winter it is a winter garden buffer, and in summer it can be fully opened, becoming the terrace to the garden. The garden was redesigned with the help of NL Greenlabel, a foundation that promotes sustainable gardening.

At SDE2014 Prêt-à-Loger was awarded five prizes, among which the Sustainability award, based on the holistic perspective on people, planet and prosperity in the everyday life of common people. This is also reflected by the many public visits to the project. The house was rebuilt on the TU Delft campus, serving demonstration, educational and research purposes.

KEYWORDS: Sustainable building; terraced house; retrofitting; zero-energy; living quality.

Introduction

The Solar Decathlon is an international student competition for homes that can function entirely by renewable energy. It was initiated in order to demonstrate new, sustainable directions for the design of houses (US Department of Energy, 2014). The houses are
constructed on site and assessed by ten criteria, hence the name. Since 2010 the American competition got its European version. The Solar Decathlon Europe 2014 (SDE2014) competition was held in Versailles, France, in June/July 2014, specifically addressing local issues of the teams partaking. As one of the finalists, the team from the Delft University of Technology (TU Delft) chose to take on the challenge to improve existing homes, rather than new ones. Research revealed that around 20% of Dutch housing consists of terraced houses built between 1946 and 1975 (SenterNovem, 2008), which have a poor energy performance, endure moist and mould problems and to modern-day standards offer too little living space. Demolition and sustainable new construction therefore seem a logical option, but with 1.4 million of these houses in the Netherlands alone (millions more in other parts of North-Western Europe), this would entail a relentless operation and massive destruction of capital. Moreover, there is preciousness involved. Inhabitants turn out to cherish these homes; almost everyone in the Netherlands once spent a part of their life in them.

![Figure 1](image)

**Fig. 1. The reference dwelling, located in Honselersdijk, Western part of the Netherlands.**

This is why the TU Delft team chose a real terraced house as the reference for their retrofit design (Fig. 1). It was the former home to one of the students’ grandfather and father, a typical example from 1960. Over time it has become obsolete, for it lacks space, comfort and consumes around €175 each month for energy. In accordance with Stroomversnelling, a public-private programme to stimulate energy renovation of dwellings, the annual net energy consumption should be brought to nil (‘zero at the meter’) by measures that do not exceed the former expenses for energy. So inhabitants pay an equal amount of domestic expenses but get a better, more sustainable home in return (Platform 31, 2013).
The team stayed true to the actual situation of the house. All realistic features were copied in the prototype retrofit version, including all construction properties, garden sizes, opaque side, and the relatively unfavourable south-east orientation. The team wanted a plan that enables the inhabitants to keep living in their home, to be solved by 'The Skin', a collection of interventions to the outer skin, both roof, façades and ground floor. The Skin thus improves both the spatial and the climate performance of the existing house, without touching the quality of a home. Hence the name Prêt-à-Loger, ready to inhabit.

**Design method**

In line with the design method taught at TU Delft and coached and supervised by faculty advisors, students approached the retrofit challenge by means of 'smart & bioclimatic design'. This is a design approach that utilises the local characteristics in the sustainable design of a building (Dobbelsteen & Linden, 2007). Students are taught to first analyse the climatic, natural and technical circumstances before translating these into boundary conditions for the architectural design and eventually optimising the local features by smart technology. In that sense it takes a pragmatic stance to 'bioclimatic design’ (Yeang, 1996), which tries to avoid technology and 'smart architecture’ (Hinte et al., 1999), that predominantly seeks a technological approach.

In the case of Prêt-à-Loger, smart & bioclimatic design helped to conceive an integrated energy system for the house. Most striking features of these are the well-deliberated thermal post-insulation, the efficient soil/PCM-stabilised ventilation system and, most novel, the solar glasshouse. This addition merges well with the surroundings: Honselersdijk is part of the Westland area between Rotterdam, The Hague and Delft, characterised by horticulture, demonstrated by extensive greenhouses for food and flower production.

From the beginning, it was clear to the students that presenting a sustainable home to people (in terms of its technical performance) has no added value if it does not improve the quality of living. Indoor climate conditions will be improved by common energy retrofitting strategies (post-insulation, window replacement and renewal of building services); the Prêt-à-Loger team wanted to give dwellers something extra, to render the home attractive for a long time to come. The solution for this is found in the four-seasons’ functionality of the solar glasshouse and in the sustainable garden. Thus, the Prêt-à-Loger team pursued a balance between what should be preserved (home) and what should be improved (house).

**Building design**

The Skin consists of interventions to four surfaces of the house: roof, two façades and ground floor. Part of the interventions are passive measures to reduce the energy demand.
The roof gets thermal post-insulation from the inside and a vegetated roof is added to the north-west slope. The typical Dutch facade from the 1960s consists of two gables, a load-bearing inner limestone gable (10 cm) and an outer brick gable (10 cm), separated by a cavity (5 cm). In modern-day houses this (wider) cavity is filled with thermal insulation material; back in 1960 it was kept void for ventilation purposes only. On the cold north-west elevation the outer gable is replaced by a 20-25 cm layer of insulation, finished by brick slips that make the wall look as its origin. The warm south-east wall cavity (also 5 cm) is filled with thermal insulation, and a glasshouse is added to the skin.

The soil has a relatively constant temperature, corresponding with the mean temperature of the local climate. Therefore, the plan was to introduce soil collectors for air drawn into the house before it passes a heat recovery unit. At the SDE 2014, digging into the ground however was not allowed, which the team solved by introducing phase change material (PCM) batteries in the crawl space of the house. In summertime, air passing through these PCMs is cooled before entering the home.

The smart glasshouse is a combined passive and active feature of Prêt-à-Loger. PV-cells are integrated in the glazing for the house’s entire electricity production. A plate collector, connected to a heat pump boiler, is placed between the old and new roof, producing hot water and cooling the PV cells, which therefore become more efficient. The glasshouse provides the house with energy year round, contributes to the climate performance of the house, and (not least) provides extra space.

Fig. 2. Prêt-à-Loger at the SDE 2014 in Versailles, showing a cross-section through the neighbours.
1. In winter it remains closed and functions as a passive heat buffer, both for hot water and for ventilation via a heat exchanger. It functions as a winter garden, through which inhabitants enjoy green and produce food during winter.

2. In spring and autumn it is also mostly closed yet boasts a comfortable temperature, because of which it can serve as living space. The dwelling can be ventilated directly via operable windows and doors, using the preheated air from the glasshouse.

3. In summer it opens up completely by the folding door, becoming a part of the garden. In hot periods two sets of operable window hatches at the top and front allow a chimney effect incited draft that provides cooling, while at the same time optimising the performance of the solar panels. The hatches can be operated by the house’s domotics system, either manual or automatic.

Other sustainability measures

The climate system described above led to a very good energy performance at SDE2014, and simulations predict net zero energy use during a full year. Tests and measurements are currently executed to validate these simulations (Xexakis & Dobbelsteen, 2015). Next to energy, Prêt-à-Loger took into account a myriad of sustainability aspects.

**Water:** rainwater is infiltrated through permeable materials (e.g. Olivine gravel and garden borders) or buffered (vegetated roof on the north-west side, up to 32 l/m², and borders, capable to buffer 90%), or collected, stored and used for toilet flushing, cleaning and irrigation (2,000 litres, at least 18% of freshwater savings).

![Fig. 3. Prêt-à-Loger water system.](image)
Biodiversity and food: there is use of local organic plants, flowers and trees in the garden; local and environmental friendly materials are used; vegetables and herbs grow in the private garden and glasshouse.

Waste: the house has a waste management system; waste is prevented during construction; prefabricated elements are used, such as the glasshouse; materials in the Skin are reused or recycled by 80%.

Collaboration and partnerships

In order to kick-start the project’s collaboration with the market the TU Delft team put together a committee of recommendation, consisting of leaders in the sustainability and building sector, for instance chairs of branch organisations in the building industry. Partnerships were pursued with companies who could support in kind (products, hours) or cash. With the Dutch ministry of Internal Affairs on board, in spite of the national building crisis, an extensive group of companies decided to support Prêt-à-Loger. After the final green light given by the university (six months before the competition start), pressure-cooker sessions were organised for the Prêt-à-Loger team and its partners, in order to achieve specific results at the end of the day. These proved to be very intense but effective and fun too. The preparation and construction stage were done in an intensive process of collaboration.

Communication

Prêt-à-Loger actively sought publicity to communicate and discuss with the intended audience. Visiting fairs, organising events, presenting the project to interested parties, and using social media were means to facilitate an active discussion about Prêt-a-Loger’s concept, vision and design. Public presentations played a big role in communicating the story behind the project and receiving valuable feedback. With around 25 events throughout the country and with a wide range of public, from citizens of Honselersdijk and highschool children to seasoned professionals, the word was spread and every aspect of the project was discussed. Social media have been important for active communication. With an account on Facebook, YouTube, Twitter, LinkedIn, Google+ and Instagram, Prêt-à-Loger was present on all currently popular media.

Passive sources of information were used to inform the general public and press and as a source of information on the project for interested parties. The Prêt-à-Loger website presented all relevant background information; it included blogs, articles from the press, audio-visuals, pictures and live stream footage of the construction process.

The Home with a Skin made it to national television four times, reaching a crowd of millions, was published in newspapers throughout the country, hosted on websites with over
375 articles in 9 languages and interviews with team members aired on numerous radio stations in the Netherlands.

Audio-visuals have proven to be an informative method of communication for people that want background information in an accessible way. Numerous requests for the original material of Prêt-à-Loger footage were received, which indicates that these videos provide quality information and are worth watching.

Fig. 4. Prêt-à-Loger signage.

Special importance was given to the design of Prêt-à-Loger’s brand identity. The two colours used in the logo are blue and white - directly derived from the Dutch street-signage from the 1960s, the period in which (most) terraced houses were built. In an attempt to further contextualise the brand, with the colours, typeface, border and house-icon with inhabitants, the logo addresses the street, the skin, the house and the home in combination with the team-name Prêt-à-Loger and product Home with a Skin (Fig. 4).

Process

The reason to participate in the SDE2014 was to gain experience for the individual students in designing and building in practice as well as learning to work in a diverse team. Both designing and building were a cross-disciplinary process executed by students from fourteen different study backgrounds and sixteen different nationalities. Learning processes were mainly found in organising and managing a large team to work efficiently towards one goal and in the communication and cooperation between different professions. The pavilion itself together with the outcome of the competition is proof that the project in this regard is successful.

Results, discussion and recommendations

During the competition in Versailles the following prices were won: 1st price in sustainability, 1st price in communication & social awareness, 2nd price in energy efficiency and 2nd price in construction management & safety. Overall, the team ended third with less than 3 points difference (out of a total of 1000) behind number 1.
In every design decision the house was imitated as realistically as possible. For example, exactly the same type of brick was chosen as outer wall finishing and the mass of soil was imitated using phase change materials. The exact orientation was copied, even though it is not optimally north-south orientated. This underlines the aspect that when dealing with an existing situation, orientation is part of the context. In few respects the original house in Honselersdijk was adapted to fit within the boundary conditions of the Solar Decathlon competition. The trade-off has been mainly regarding size, to fit within the Solar Envelope, and materialisation, to make it constructible within the time set. The most important aspect for representing the house in Honselersdijk is the quality and identity of a Dutch ‘home.’ This forms the main concept for the interior design: no hyper-modernistic unaffordable interior, but an existing home of a common Dutch family. To present the aspect of an ‘existing home’, a combination of second-hand furniture from Dutch families and austere new furniture were used (figure 5). Furthermore, elements that determine the identity of a home, such as pictures on the wall, shoes in the hallway, were implemented in the interior design.

Fig. 5. Interior of the Prêt-à-Loger house during visits at SDE2014: nothing fancy, all realistic.

With the house being constructed in Delft several thousands of people have visited the house. Professionals, students as well as inhabitants have been given tours, presentations and workshops in the prototype house. All visitors have been enthusiastic about the project.
The house has had extensive monitoring to test its performance. Part of these tests were executed in Versailles as part of the competition during summer 2014. Other tests were executed in Delft in winter, as part of graduation research projects and in preparation of this article. Apart from this research into the technical performance of the house, feedback from visitors has also been documented. The prototype itself will continue to be used for research and education as well as creating awareness of sustainability and the possibilities of living quality among home-owners.

With over 375 known publications in journals, magazines, tv shows and websites it can be said that the Prêt-à-Loger project has had quite an impact on both the professional world and society. Smaller and bigger contractors are currently developing similar solutions, which emphasises the influence Prêt-à-Loger has had.

Taking into account these results, part of the Prêt-à-Loger student team decided to start investigating the possibilities of a start-up. The Prêt-à-Loger concept will be made into a marketable product.

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Session 5

Collective Agency 1
Interdependence and Sustained Collective Action: The case of four collective housing communities in Mexico City

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ABSTRACT We study under which conditions collective action breaks down into some communities but keeps sustainable in others. The main purpose of our explorative qualitative study is to identify the micro-level pathways that lead to the maintenance and decay of collective action. Drawing on sharing group theory, and common pool resources theory, we claim that different interdependence settings lead to different types of cooperation, and that only under certain conditions, cooperation will remain stable over time. A multi-method comparative case study approach was used. Interview, observational, video, and survey data was collected in four different low-income urban collective housing communities in Mexico City in 2010. Content analysis reveals five major mechanisms linking interdependencies to cooperation or its absence. First, in all four communities, real property transfers and /or damages resulting from an earthquake triggered successful agency- collective action. Second, in all four communities, urgency-collective action resulted from events caused by the poor construction quality of real estate. Third, repeated collective action in the form of recreational activities was found in those groups where inhabitants successfully capitalized the opportunities of a relative abundant space. It was also found where neighbours were able to organize around use and maintenance of common property. Four, powerful norm violating newcomers caused breakdown of cooperation in one community. Fifth, collective action was absent in the community where common space was scarcest. Here, scarcity triggered conflicts about access to and use of space. Our study contributes to the literature on cooperation by pointing to differences in interdependencies settings and compliance to norms, as major indicators to predict sustainable collective action.

KEYWORDS: cooperation; collective action; sustainable cooperation; interdependencies; common space; comparative case study; collective housing; Mexico City.

Introduction

After a strong earthquake, two collective houses collapsed at two different communities. Houses could be rebuilt after a long cooperation process among neighbours. Ten years later, neighbours in the first community have neglected the premises, and the common areas are dirty and abandoned, whereas members in the second community, are organizing a party to celebrate the purchase of solar cells that will power the light at night. Why is
collective action sustainable in some housing communities, and why did it break down in others?

Collective action “occurs when more than one individual is required to contribute to an effort in order to achieve an outcome” (Ostrom, 2004: 5). Sustainability refers to the capability of maintaining something in existence (Marshall and Toffel, 2005). Hence, sustainable collective action refers to the type of cooperation that is permanent over time. Answering the question what makes cooperation in housing communities sustainable can increase the capacity for responding to the problem of resource scarcity given the context of growing urbanization. Unfortunately, the pathways leading to sustainable cooperation are still little understood. The present study is a step into this direction. Drawing on sharing group theory (Lindenberg, 1997) and common pool resources theory (Ostrom, 1990, 2000), we analyse the conditions that facilitate sustainable collective action in small, low-income urban communities. Both approaches differ in various respects, but they agree that interdependencies can be a major trigger for collective action, given they are accompanied by formal and/or informal institutions enforcing cooperation. We add to this literature in two ways. First, we introduce a fine-grained distinction of four types of collective action as they are relevant for housing communities. Second, using a case-study approach, we identify the micro-level pathways that lead to the maintenance or decay of cooperation. In addition, we explore the role of common space and common property in the formation of different types of interdependencies.

<table>
<thead>
<tr>
<th>COMMUNITIES (C)</th>
<th>C1 Pedro Anaya 190</th>
<th>C2 Tripoli 910</th>
<th>C3 Gorostiza 36</th>
<th>C4 Labradores 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size - central courtyard</td>
<td>small (1.80mX36m)</td>
<td>Medium (3.60mX25m)</td>
<td>Big (4.50mX18m)</td>
<td>Medium</td>
</tr>
<tr>
<td>Density (inhab/DU)-Max</td>
<td>2.5 5</td>
<td>2.5 6</td>
<td>4.2 (5)</td>
<td>4.0 (6)</td>
</tr>
<tr>
<td>Number of dwellings</td>
<td>24</td>
<td>07</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>Dwelling / m²</td>
<td>12m²</td>
<td>40-52m²</td>
<td>60-140m²</td>
<td>48m²</td>
</tr>
<tr>
<td>Construction quality</td>
<td>Bad</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Common facilities</td>
<td>WC, laundry</td>
<td>Laundry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-Economic status</td>
<td>Very low</td>
<td>Low-Medium High</td>
<td>Low-Medium</td>
<td>Low-Medium</td>
</tr>
<tr>
<td>Education</td>
<td>Illiterate-SS</td>
<td>PS-Uni</td>
<td>PS-Uni</td>
<td>PS-HS</td>
</tr>
<tr>
<td>Types of cooperation</td>
<td>Agency 2x Urgent 3x</td>
<td>Agency 1x Urgent 1x Leisure Maintenance</td>
<td>Agency 2x Urgent 1x Leisure Maintenance</td>
<td>Agency 2x Urgent 1x</td>
</tr>
<tr>
<td>Frequency 3x, 2x, 1x, High, Medium, Low</td>
<td>In C1, Sustainable cooperation (Leisure and Maintenance) never emerged, while in C2, it came to an end</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Theoretical framework

Interdependence is one of the most powerful mechanisms to explain cooperation. Members of a group are interdependent when actions performed by any individual generate externalities. This creates regulatory interest, which in turn triggers the need for norms and sanctioning (Heckathorn, 1990; Van de Bunt et al., 2005).

Sharing group theory argues that functional interdependencies are characterized by the fact that individuals do share a common goal, which they would not be able to realize on their own (Lindenberg, 1997). Interdependencies can vary in strength, depending on the degree to which an individual's goal achievement is influenced by actions performed by other persons (Rusbult and Van Lange, 2003). During the cooperation process, interactions among individuals influence each other's minds, creating affective relations among participants (Lindenberg, 1997). The stronger the perceived interdependence is, the more likely the formation of a group identity among participants (Anthony, 2005).

Common pool resources (CPR) theory emphasizes the social dilemma aspect of interdependencies, and in particular the need to solve the related second order free-riding problem of sanctioning those who violate the rules. CPRs are "...natural or humanly created systems that generate a finite flow of benefits where it is costly to exclude beneficiaries and one person's consumption subtracts from the amount of benefits available to others" (Ostrom, 2000:148). "Social dilemmas occur whenever individuals in interdependent
situations face choices in which the maximization of short term self-interests yields outcomes leaving all participants worse off than feasible alternatives” (Ostrom, 1997:1). The second order free-rider dilemma occurs when individuals will bear the costs of sanctioning the free rider while other community members cannot be excluded from enjoying the benefits of cooperation (Ostrom, 1990). Users make efforts to establish stable conditions of cooperation that perpetuate the benefit of the resource.

Both approaches suggest that the creation of rules and norms is as solution to solve social dilemmas (Lindenberg, 1997). Especially in settings where communication is allowed, strong interdependencies are likely to result in the creation of such social norms, and also in their implementation through active sanctioning of non-compliance (Ostrom, 2000). What both approaches so far left unexplored is the question under which conditions such norm-based collective action will break down or remain sustainable. Our in-depth investigation of four such communities tackles exactly this problem.

Methodology

To investigate how variations in interdependence affect the sustainability of cooperation in real life neighborhoods, we did an explorative qualitative study. A multi-method comparative approach was used. Observational, Interview, video recorder, and survey data was collected in four different collective housing communities in Mexico City in 2010. Direct observation was performed at irregular intervals over a period of three months. It included participating in social activities such as attending meetings, joining lunch and entering into a long informal conversations. Semi-structured interviews (duration thirty minutes to two hours) were conducted with three different types of stakeholders: two experts in housing and urban development; one key informant in each compound; and fourteen neighbors. The interviews focused on how social dynamics in collective housing were shaped by their social historical context, and on neighbors’ perceptions of exposure to different interdependence situations. Finally, a total of twenty-eight questionnaires were distributed among participants to capture diverse information, including socioeconomic data. Conversations topics from video recorder sessions were classified into categories for further analysis.

Four collective housing communities

Characterization

In all four cases, all the houses are on the ground floor distributed around a central courtyard. We distinguish four different communities corresponding to four different cases. Community 1 (C1) is located in Pedro Anaya 190, in the Martín Carrera residential area, to the north of Mexico City. Community 2(C2) is located in Trípoli 910, in the Sta. Cruz Atoyac residential area, in the central area of the city. Communities 3 and 4 (C3, C4) are located in
Gorostiza 36 and Labradores 23 respectively, in the Morelos residential area, near historical centre. There are significant differences between cases (see table 1). Currently, all neighbours hold property rights, but they share ownership over common areas.

Two kind of interdependencies can be distinguished within this context. On the one hand, interdependencies can emerge when community members have to react to external actors or conditions (e.g. formal authorities encouraging them to change property ownership). In this case, cooperation is a linear process that ends when the objectives are met. On the other hand, interdependencies can play a vital role in shaping cooperative acts in daily life within the community (e.g. cooperation around maintenance of common property). If successful, this kind of cooperation persists in time.

Collective action induced by external formal authorities or urgencies

Functional interdependences triggered agency and urgency collective action. Here, group members work together to achieve common, well-defined goals. These two kinds of cooperation occurred in all four communities.

Agency-induced cooperation is triggered by different outgroup formal authorities. While carrying out research, C1 was being guided by an urban leader to meet legal requirement to demolish the current collective housing layout. The perceived lack of space, associated with lack of privacy, makes the members of this community want to replace the collective housing by an individual-apartment building. A nongovernmental organization guided C3 and C4 through the remodeling and reconstruction process respectively after their homes were totally or partially destroyed by an earthquake in 1985. Both communities successfully completed the two different processes approximately one year after the shake.

In four cases, the entire property originally belonged to only one owner who offer her tenants to purchase real estate. All groups were guided by different organizations in the legal process to transfer ownership from private property regime to condominium property regime at different times. Activities related to agency-type of cooperation are: regular meetings, collective decision processes, legal action to stop relocation, and collecting money for different joint activities.

Urgency-induced collective action arises from poor quality construction of the buildings. Actions related to this type of cooperation are: to demolish a roof before it falls down on the occupants, to repair collapsed drain or plumbing pipe, to repair leaky roofs, and to restore power.

In all reported cases, high degrees of organization are required to achieve the different goals. This can only be achieved with a sizeable proportion of the members cooperating. Our fieldwork revealed that where inhabitants were exposed to such high degrees of
interdependence, they developed strong positive emotions and trust, as well as an identity as group members. In all groups, cooperation levels were high and they achieved the different goals. However, cooperation came to an end when goals were achieved (Figure 1).

Collective action induced by leisure activities or maintenance requirements

**Leisure** and **maintenance** collective action arise from interdependences involving the use and management of common resources (courtyard and buildings). A relative abundant common space offers multiple benefits to everyone. For example, it is the space where inhabitants can keep their plants and pets, where they can rest in case the private space is too small. It is perceived to be a safe space, so also children and older inhabitants come there. Inhabitants are aware of their interdependence. For example, if a neighbor plays her music in the central courtyard, everyone can hear it.

Cooperation activities included the organization of celebrations, meetings and gatherings. Unlike opportunities provided by the central courtyard, maintenance practices are perceived as actions that demand high levels of sacrifice. In this case, individuals have to make financial contributions or participate. Actions related to this type of cooperation are: painting, water tanks maintenance and to carry out a variety of repairs.

Different processes and mechanisms were linked to different cooperation outcomes in each case. First, scarcity of space and financial resources prevented the emergence of both, leisure and maintenance collective action in C1. Moreover, internal conflict about access to use it was experienced due to lack of space. Second, the arrival of new neighbors involved in drug traffic associated with widespread violation of established norms, translated into advantageous economic and social power asymmetries in favor of offenders, causing collective action failure in C4. Third, a very strict official regulation regarding use of common space, in combination with an excess of mutual trust and tolerance, caused generalized deviations from the norm among participants in C2, leading to uncertainty to ensure future compliance with agreements. Fourth, violation of group norm, in combination with an excess of trust, and communication, caused gossip in C3.

These factors are threatening collective action. However, neighbors in C2 and C3, successfully solved inconveniences through social process. Breaking official regulation regarding use of common space, caused negative externalities that affects all users in C2. The effects of externalities increased over time. Significant disagreement was caused by leaving dog droppings in the common courtyard. Here, neighbors liked the dog, which helped to regulate their anger. On the other hand, C3 experienced a typical second level social dilemma case, in which one individual decide to pay a cost to sanction people – through gossip – who fail to cooperate. This causes temporary discomfort between some neighbors, leading to greater community benefits.
In both types of cooperation, formation of trust and identity through previous collective action helped to successfully solve first and second level social dilemmas involving use and maintenance of common resources.

Conclusion

In all four communities, transferring a title of real estate and / or damages resulting from the earthquake had triggered successful agency collective action. Urgency-induced collective action arises from building condition, and it was necessary to mitigate imminent safety threats. These two kinds of cooperation were directed towards achieving specific goals, and stopped after the objective was achieved.

Whereas these collective actions created and reinforced trust and cohesiveness within all four groups, sustainable leisure and maintenance-based forms of collective action continued only in two of the communities (C2 and C3). In both cases, trust and identity built during the earlier agency and urgency phases helped to solve both first and second order free-rider dilemmas involved in using and maintaining common resources (courtyard and real estate). Permanent enforcement of norms was crucial to maintain cooperative relations.

In the other two communities (C1 and C4), all types of collective action came to an end, and no collective leisure- or maintenance-based actions occurred. In C1, scarcity of space and economic resources were major obstacles to collective sustainable action involving management of common resources. In C4, violation of norms by newcomers translated into advantageous economic and social power asymmetries in favor of offenders, causing failure of collective action.

Our case studies confirm previous theoretical claims that having successful past experiences with collective action in achieving common goals and managing common resources may be a crucial first step in the process of building sustainable cooperation in housing communities, because they contribute to building interpersonal trust and a strong group identity. Our analysis also shows that sustainable cooperation was only observed in interdependencies resulting from the use of common resources. In all four cases, cooperation remains brittle and can quickly break down, for example due to scarcity of physical space or economic resources, or to powerful norm-violators joining the community.
References


ABSTRACT Jakarta – the capital city of Indonesia – is frequently drowned, as current water infrastructure along its main city river Ciliwung is inadequate for a city that accommodates ten million people. As vulnerable parts of the city have been flooded at least two times every year in the past five years, there are challenges on how these parts may thrive in such an exposed site. This article, based on fieldwork observations of current self-organised waste disposal practices by informal settlement dwellers in the frequently flooded site around the Ciliwung river, proposes to explore how these recurring crises in urban infrastructure and services have led to physical and socio-material adaptations to the practices of the inhabitants of the informal settlements in question. It will be discussed, how, in the absence of formal waste collecting services (as formal communal waste bins are always carried away by the flooding), the dwellers have found alternative ways of disposing waste individually. Waste disposal practices are tightly connected not only to the location of each dwelling in relation to the river but to the daily routes taken by the dwellers within and around the neighbourhood. These routes connect key areas of the neighbourhood such as entrances, pathways, public toilets and nearby public places that further influence how waste disposal is organised. There are also relations between the occupation of the dwellers and the amenities within their dwelling which in turn have impact on the site of disposal and further treatment of the waste. The research on which this article is based is an attempt to rethink the intertwining of the dwellers waste disposal organisation with the ecological and spatial formation of the neighbourhood and addresses the need of formal waste services to understand how the production and disposal of waste is related to each dweller’s daily practices.

KEYWORDS: Indonesia, informal settlements, household waste, self-organisation, collective practices, flooding, ecology.

Introduction

Infrastructure is emergently seen as a complex and contingent social and technological process reproduced by everyday practices instead of a hidden and straightforward thing (Graham & McFarlane, 2014). This article investigates waste disposal practices in recurrently flooded informal settlements (kampung) situated along the low-lying river terrain of the Ciliwung river in Jakarta, Indonesia. The increasing number of incidences of flooding worldwide has shifted the discussion from flood prevention to flood risk management, with...
solid waste management being an important feature in such discourse which concerns the practice of disposal and collection of waste (Lamond, Bhattacharya, & Bloch, 2012). This paper addresses such practice through a process of waste infrastructure carried by the kampung dwellers as reoccurrences of flooding have hampered civic waste collection.

In late July 2015, the government will begin to decant a total of 2,000 residents from Kampung Pulo to enable river normalisation by widening its current width from 10 m to 30 m (Elyda, 2014) as the flood frequency increases each year (Kompas, 2014b), leading to a prolonged evacuation which affects 3,427 people in Kampung Pulo and destroyed at least 500 houses last year alone (Kompas, 2014a). This paper suggests that decanting should not be the primary sought response in reorganising the riverbank area, as it is socially and economically unsustainable in the long term (Hodal, 2013). Instead, future reorganisation should be based on understanding of how occupants engage with the riverbanks areas through their daily practices, particularly in their waste disposal practices that provides impact to the river and its surrounding areas. This knowledge is significant not only in future reorganisation of livelihood of remaining riverbanks dwellers as only a third of Kampung Pulo dwellers are relocated this year (Nurito, 2015), but also for riverbanks dwellers elsewhere in Jakarta and beyond.

This paper therefore attempts to explore how informal dwellers dispose, situate, and treat their waste in accordance with riverbank occupation, in particular how it may inform an ecological understanding of the riverbank area. It explores how waste practices is adapted within the context of neighbourhood by focusing on (1) the daily routines and rhythms of the dwellers in producing their waste and (2) different modes of situating and displacing their waste across multiple boundaries within the wider neighbourhood. This routines and modes are then examined to inform an understanding of the ecological relationship between waste organisation and spatial formation of the neighbourhood in riverbank areas.

**Challenges of waste disposal practices in informal riverbanks settlement in Jakarta**

The research presented is based on narratives from dwellers in Kampung Pulo, an urban informal settlement that is situated alongside the Ciliwung river terrain in Jatinegara area, Jakarta (Fig. 1). Almost a third of Jakarta’s citizens are informal dwellers (Jakarta Statistic Center, 2013) and four to five percent of them (around 120,000 households) are situated in settlements along the riverbanks (UN-Habitat, 2003) such as Kampung Pulo.

The presence of informal settlements that occupy riverbanks in Jakarta has been widely discussed, particularly around the dwellers’ reliance on the river in their daily activities such as washing, bathing, and defecation (Colin McFarlane, 2009; Emirhadi Suganda, Paramita Atmodiwirjo, & Yandi Andri Yatmo, 2009; Lamond et al., 2012; Vollmer & Grêt-Regamey, 2013). These activities often lead to riverbank dwellers being ‘caricatured as the primary
source of pollution’ (Vollmer & Grêt-Regamey, 2013, p.1552). However, little attention has been given to the various contested ways of which waste is locally organised and the complex daily experience of dwellers in disposing their waste amidst unreliable services and environmental problem (Graham & McFarlane, 2014; Zapata, 2013, Bunch, 2003). This paper addresses the ecological relationship between the dwellers disposal routines and the settlement’s spatial formation to understand the dwellers better ‘as actors in a more complex system’ (Vollmer & Grêt-Regamey, 2013, p.1552). This relationship is the basis of building ecological resilience in the area, where human-nature couplings is instrumental to expands the capacity to self-organise and adapt in changing environment conditions (Liao, 2012).

Some of the causes of recurrent floods in riverbanks settlement in Jakarta are the shallowing of the river and drainage blockages that largely caused by accumulation of solid waste (BPLHD, 2015). Such accumulation put informal dwellers occupying affected areas to be blamed (Colin McFarlane, 2009) as they also delay the attempts to clear the blockages (Lamond et al., 2012). Solid waste management, however, is a particularly challenging aspect of urban systems (Lamond et al., 2012; Medina, 2005) and it is necessary to understand how waste infrastructure may become contested in such areas.

Challenges on waste management of riverbank dwellers in Kampung Pulo occur as there are mismatches between regulated waste services with actual condition of riverbank settlements. The formal waste agency in Jakarta only regulate waste collection and transfer processes from neighbourhood clusters to the temporary and final landfills (Jakarta Province Sanitary Agency, 2013). Waste collection within the neighbourhood is organised by community itself either using door to door collection or by situating multiple carts in multiple locations of the neighbourhood as collective waste dumping areas in densely populated areas. However, such collection processes cannot be applied consistently in Kampung Pulo as the recurrent flood creates unreliable availability of local manpower and amenities that bring the waste together (e.g domestic trash bins and waste carts). The configuration of neighbourhood itself also presents challenges to access waste source and transport them outside the neighbourhood. It becomes the starting point of this paper to discuss the local waste disposal practices developed by dwellers in the absence of formal services in relation to neighbourhood spatiality.

Waste practices, dwelling structure and neighbourhood ecologies

Waste disposal practices are connected to how dwelling processes are structured (Bulkeley & Gregson, 2009), particularly in relation to how sorting and disposal processes are arranged at home and how waste is then transported to further systems. Without formal waste collection services dwellers need to construct their own ‘passage’ (Metcalfe et al.,
2012) to dispose waste out of their household. This passage is an active process of dwelling that is constructed through a series of ‘ritualized practices’ (Ozaki & Lewis, 2006) and links ‘across the different places through which they move’ (Morley, 2012). These ritualized practices are done through personalised movements, tools, and infrastructure needed to perform a series of activities through time and space (Pink, 2012). It has been noted that the dwellers’ reliance on the river for their domestic activities including waste dumping decline as proximity with the river decrease (Vollmer & Grêt-Regamey, 2013). In contrast to this observation, this paper argues that the connection between the dwellers’ disposal practices and the river cannot be solely determined by their dwelling location, but instead is related to how the dwellers routinely and actively move around the neighbourhood and the river and the routes they take as part of their dwelling processes.

Ecological resilience to floods is acquired through living with disturbances (Liao, 2012) and therefore the exploration of ecological relationship between dwellers routine practices and riverbanks areas enables contribution on how such living process can be understood. Ecologists are increasingly working with dynamic ecologies where disturbance and flux exists (Forsyth, 2002) and matter flows outside the closed loop (Gabrys, 2009). Through this active process of disposal, waste is not considered as contained, but migrates through environment and changes it accordingly (Gabrys, 2009). Further exploration is necessary to understand how dwellers actively navigate their waste disposal practices within their neighbourhood and its surrounding area in addition to the river.

Methodology

The research of self-organised waste disposal practices in this article is based on fieldwork in Kampung Pulo from June to July 2014. During the period of data collection, dwellers had just recovered from the 2014 flooding in Jakarta that lasted from January to March with water level that varies from 30 cm to 2 meters above the street level over a sustained period of three months. The focus of the paper is the waste practices of sixteen residents, each with differing occupations, who live in different parts of the neighbourhood. The study was conducted through semi structured interviews and observation of each respondent’s daily rituals and routine activities. Limited by the number of its respondents, this paper does not aim to provide a general profile of waste disposal processes of the whole Kampung Pulo dwellers but instead only intended to provide a deeper understanding on how various respondents ways of disposing waste might connected to their everyday practices and subsequent neighbourhood formations.
Waste disposal practices exploration in Jakarta

Daily Routines and Practices of Kampung Pulo Dwellers

This study observes sixteen respondents who live in dwellings with ground space sizes that vary from 2.5m x 3m (D2) to 3.7m x 9.2m (Y). Eight respondents do not have a toilet installed in their dwellings (see Table 1) and four respondents dwellings (F, U, S2 and D1) are located directly adjacent to the river (Fig. 1).

Six respondents have their business in front of their dwellings while two other respondents open food stalls along the neighbourhood main alleys (Table 1). One respondent works outside the neighbourhood area (T) in addition to running a small grocery stall from his house. Additionally, one respondent works as washing maid within the neighbourhood (R2) and another respondent works nearby as a food seller in Jatinegara market (S1).

![Fig. 1. Kampung Pulo respondents' location Source: self-drawn.](image)

All respondents state that they dispose their garbage in self-organised ways as communal waste bins within the neighbourhood are always swept away by the flood. There are four main waste dumping areas within and adjacent to their neighbourhood used by the respondents. Seven respondents dispose their waste to the main street that consists of disposing to the pushcart at the main sidewalk in the main street (B9) or to the sidewalk adjacent to the pushcart (D9). Both will be removed by a local street cleaner employed by the city every day. One respondent disposes her waste to Jatinegara Market (S1) as there are two pushcarts in the market that are regularly used to dispose waste from the market.
<table>
<thead>
<tr>
<th>No.</th>
<th>Respondents</th>
<th>Living Area</th>
<th>Occupation</th>
<th>Workplace</th>
<th>Waste Location</th>
<th>Toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>B8</td>
<td>Food seller</td>
<td>B8</td>
<td>B9</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>U</td>
<td>B8</td>
<td>Grocery seller</td>
<td>B8</td>
<td>A8-B8</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>S1</td>
<td>B8</td>
<td>Food seller</td>
<td>B9</td>
<td>B9</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>S2</td>
<td>B7</td>
<td>Homemaker</td>
<td>None</td>
<td>B7</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>S3</td>
<td>B7-C7</td>
<td>Food seller</td>
<td>C9</td>
<td>D9</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>E1</td>
<td>C7</td>
<td>Homemaker</td>
<td>None</td>
<td>B7</td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>E2</td>
<td>D7</td>
<td>Homemaker</td>
<td>None</td>
<td>B7+D9</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>E3</td>
<td>E5</td>
<td>Homemaker</td>
<td>None</td>
<td>D9</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>N</td>
<td>C8</td>
<td>Homemaker</td>
<td>None</td>
<td>D9</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>T</td>
<td>C7</td>
<td>Civil servant+ Grocery seller</td>
<td>Outside + C7</td>
<td>D9</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>R1</td>
<td>D7</td>
<td>Snack seller</td>
<td>D7</td>
<td>D9</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>D1</td>
<td>E5</td>
<td>Snack maker</td>
<td>E5</td>
<td>E5</td>
<td>None</td>
</tr>
<tr>
<td>13</td>
<td>D2</td>
<td>E6</td>
<td>Homemaker</td>
<td>None</td>
<td>E5</td>
<td>None</td>
</tr>
<tr>
<td>14</td>
<td>R2</td>
<td>E6</td>
<td>Maid</td>
<td>E8</td>
<td>D9</td>
<td>None</td>
</tr>
<tr>
<td>15</td>
<td>A2</td>
<td>E6</td>
<td>Snack seller</td>
<td>E6</td>
<td>E5</td>
<td>None</td>
</tr>
<tr>
<td>16</td>
<td>Y</td>
<td>F5</td>
<td>Grocery seller</td>
<td>F5</td>
<td>F4</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1. Kampung Pulo respondents profiles.

Another respondent disposes her waste into a communal concrete waste bin near the river (Y). The dwellers around this waste bin would put their waste inside and burn it altogether later on. Other than that, six respondents throw their waste directly into the river every day, while one respondent uses both sidewalk and river to dispose her waste.

**Situating and Displacing Waste in the Neighbourhood**

Table 1 shows that how the dwellers dispose their waste is not always related to the location of their dwelling, but largely influenced by their daily routines and the places and space that they move across every day. Fig. 2 (left) shows the routes of seven respondents who use the main street sidewalk as a place to dispose their waste. Among these, three respondents (F, S2, and R2) work closely to the main street and dispose their waste into the pushcart at the main street or drop it directly onto the main street sidewalk as it is easier to dispose their waste during their work time. This practicality becomes important despite their own dwellings being located further from the street, such as the dwellings of S2 and R2. This also applies to S1, who disposes her waste in waste pushcarts at Jatinegara market where she works regularly.

The other respondents who dispose their waste in the main street are either homemakers or owners of home business that regularly go to the adjacent market to buy their daily groceries and therefore are able to dispose along their way to the market. This occurrence shows that local businesses within short distance of the neighbourhood can be used as a
site of waste disposal, and it can also trigger the presence of other waste disposal sites in the pathways in between the market and the neighbourhood.

Respondents who dispose their waste into the river have slightly different daily routines. There is one respondent who only goes to the market once a week (D1). One respondent shops at the grocery stalls within the neighbourhood in addition to going to the Jatinegara market (E2). Waste disposal in the river observed within the scope of this research can simply be seen as being caused by adjacency between dwelling and river as the majority of respondents who use the river to dispose their waste are mostly located closely to the river around under 5m distance (Fig.2 right). However, this adjacency is not applicable to A2, D2 and E2, whose dwellings are located within 100 m distance.

It is important to annotate further that only one of the seven respondents in Fig. 2-(right) has a toilet within the dwelling (S2). This is in contrast to those who dispose their waste in the main street who mostly have toilets in their dwellings (Fig.2-left). The absence of a toilet at home leads to the regular use of the public toilet which is right next to the river, and subsequently also becomes a space to stack waste around as well as dumping waste directly to the river itself (Fig. 3).

![Fig. 2. Seven Kampung Pulo respondents who uses sidewalk of the main street as dumping area (left) and seven Kampung Pulo respondents who uses river as dumping area (right) Source: self-drawn.](image)

![Fig. 3. The edge of the river with public toilet (left) that is used to dispose the waste to the river or stack them in a concrete waste bin (right) Source: author’s documentary.](image)
This exploration shows that waste disposal practice is not only determined by the proximity between dwelling and river, but also needs to include whether the dwellers are using public amenities or not. The presence of public amenities adjacent to the river also creates an opportunity to throw waste into the river or stack it around the public toilet. The placement of waste near the public toilet can also correspond as a form of temporary placement. The availability of open space also influences how dwellers may treat their waste further after disposal. For instance, Y, together with her neighbours, stacks her waste on a concrete waste on the riverbank and eventually burns it to enable further use of the riverbank as waste disposal site.

Conclusion

Faced by the absence of formal waste collection services and permanent waste container, the dwellers of Kampung Pulo adapt their waste infrastructure by performing individual everyday waste disposal practices in relation to how they move around their neighbourhood. This paper underlines the ecological relationship of dweller’s waste disposal practices that are intertwined with the neighbourhood’s spatial formation. The trajectories between dwellings, workplace, markets, and gateways create various scenarios of waste disposal within the neighbourhood in relation to the river.

The previous exploration has annotated that dwellers’ ways of disposing their waste might related to whether they are using public amenities daily. The location of public amenities adjacent or in the river creates a possibility for dwellers to use the river to dispose their waste. There is an indication that the time spent in between this place is also relevant; there is no respondent who dumps waste where they shop as they only spend a short time in the area in comparison with respondents who work near the street and the market. This temporal quality also applies to waste that is disposed around the public toilet in the river edge, as it is the place where dwellers frequently go during the day.

More than the dwelling’s location, it is the routes taken by dwellers in relation to their everyday place to work, shop, and defecate, that influence their disposal practices. How waste migrates between these places and is then transported into a bigger system (through waste pushcarts), self-treated (burned), and displaced (thrown to the river), is therefore shaped by the dwellers’ engagement with these routes, such as their accessibility and temporality. Further exploration of this engagement is necessary to provide deeper understanding on how it influences the pattern of riverbanks occupation, its impact towards the environment’s quality and potential reorganisation towards ecological resilience.
References


Risk and Resistance: Globalization, shifting boundaries of governability and the production of new spaces of conflict and self-government

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ABSTRACT This paper will focus on the urban challenges that contemporary Mexican communities are experiencing in the face of new trends and processes linked to globalization and, by implication, social conflict. It is argued that in these conditions, the meaning of contemporary concepts such as sustainability and resilience, particularly in the fields of architecture and urbanism, will require a different conceptualization -- one which is not reliant on conventional Western design approaches where these tendencies have been less intrusive. In particular, the concept of resilience -- understood to mean constructive adaptation to risk -- is merely an ideological concept meant to transfer responsibility for confronting serious problems generated by globalization down to the level of the community and individual despite the fact that the responsibility lies in larger macro-economic forces and conditions. The purpose here is to suggest that adaption to such ‘invisible’ and destructive forces is more likely to take the form of resistance, which may help generate a certain form of resilience, but which must be considered analytically (and politically) separate in both theoretical and practical terms.

This paper sustains these arguments with a focus on urban conditions in the Mexican state of Michoacán and the ways that a system of parallel governance developed alongside a formal legal framework for dealing with insecurity. The paper unpacks a series of alternative currents (‘illegal’ tactics) operating outside more formalized state-civil society relationships, and identifies them as a form of resistance to global forces that are producing new forms of risk.

KEYWORDS: Globalization, risk, resistance, Mexico and Global South

Introduction

This paper examines the tensions produced when global forces come in conflict with longstanding communities, resources, values, capacities, and the priorities of actors and institutions’ territories of the Global South. The paper takes as its point of departure the conditions of scarcity in raw materials, human and economic resources, multicultural diversity, rapid growth and change, and the ‘chaotic’ organization of Michoacán’s territories in Mexico. Consequently, the paper documents how collective action (resistance) came about in a local community and tries to make sense of how and why this occurred.
In particular, the paper focuses on the municipality of Cheran, located in the hinterland of indigenous communities of the state of Michoacán, Mexico, where citizens decided to organize themselves around demands for justice in order to tackle a disturbing situation of struggle and social conflict. This study suggests that in the face of state failures to accommodate social demand – in this case to reduce explosion of violence -- citizens turned to self-organization, self-defense and, ultimately, self-government as the alternative to predefined notions of sustainability and resiliency of conventional western approaches. In other words, different conditions in the Global South demand an alternative understanding of such concepts.

In many parts of the Global South, illicit activities are concentrated not only in certain urban spaces, but also in isolated rural areas working as expanded networks. ‘Isolated networks,’ as Castells defines those parts of the remote territories that are used to support the supply of illicit goods, demand creating new spaces of social conflict (Castells 2014). Consequently, part of the growth in Mexico today has a lot to do with this paradoxical relationship between global-local economies, formal-informal legal frameworks and urban-rural territories. However before discussing this argument further, it is important to understand the previous decades’ economic dynamics -- 1940s until the 1980s -- before Mexico opened its economic structure to global markets.

**Background: Liberalization substituting the Import Substitution Industrialization (ISI) model**

Similar to many other developing countries, but perhaps faster and further than most, since the 1980s Mexico has been moving toward a liberalized trade regime after a long period of import substitution industrialization. Economic changes usually resulted in reductions in formal employment in industry in comparison to informal employment growth in small-scale commerce and other minor services. Previously, government employment generally was picking up the slack and providing some sort of equilibrium stability as part of the Import Substitution Industrialization (ISI) model. After WWII, The ISI model was based on the premise that a country should attempt to reduce its foreign dependency through the local production of industrialized products. This approach was the main trade and economic policy used by nationalist Mexican government, represented by the PRI party, during the ‘Mexican Miracle’ period from the 1960s until the 1970s, after which the PRI advocated replacing foreign imports with domestic production (Werner Baer 2009). Consequently these policies were enacted by countries in the Global South with the intention of producing development and self-sufficiency through the creation of an internal market. This model worked by having the state lead economic development through nationalization, subsidization of vital industries (including agriculture, power generation, etc.), increased taxation, and highly protectionist trade policies (Street and James 1982). However Import
Substitution Industrialization was gradually abandoned in the 1980s and 1990s. Some explanations were described as structural indebtedness from ISI-related policies on the insistence of the IMF and World Bank through their structural adjustment programs of market-driven liberalization aimed at the Global South (Puyana and Romero 2006).

**Globalization and informalization**

In the last two decades market-driven liberalization and investment patterns are having a dramatic impact on the precarious balance of the Mexican economy. Global trade liberalization, embodied as globalization, has disrupted all sectors of the economy, urban relations and work arrangements. The neo-liberal turn toward a downsized state and the promotion of greater global competitiveness has driven many countries to reduce traditional economic drivers. Global trade and investment patterns tend to privilege capital, especially companies that can move quickly and easily across borders, and to disadvantage labour, especially lower-skilled workers. With the aim of increasing global competitiveness in an export-led industry, more and more investors are moving to countries like Mexico that have low labour costs.

Furthermore, there has been a radical restructuring of production and distribution in many key industries characterized by outsourcing or subcontracting through global commodity chains. The net result is that more and more workers are being paid very low wages and many of them have to absorb the non-wage costs of production (Rodrik 1997). Globalization has also meant that two of the main sources of formal economic growth in Mexico during the neoliberal era -- export-led industrialization and the development of high-end financial services strongly linked to capital, speculation, real state, urban development and the information economy -- tend to exacerbate social and income polarity (Davis 2012).

Saskia Sassen argues that, as a result, globalization is emphasizing the development and materialization of two extremities and creating a division between its societies in many cities around the world. On the one hand, the “mega project of glamour,” created by a wealthy component of the population, promoting bubbles of land speculation and high economic profit, and on the other hand, the “project of marginalization,” in which the entire service sector or, in other words, the strategic working force lives ¹. However, Sassen argues that both models are strongly linked to each other due to their intrinsic interdependence. The expanding growth of services has become more extreme, at the same time, income

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1 Saskia Sassen has pointed out this argument from a different perspective in different books such as: Globalization and its Discontents (New York, New Press, 1998); Losing Control? Sovereignty in an Age of Globalization (Columbia University Press, 1996) and Cities in a World Economy (California, Pine/Forge Sage, 1994). In Spanish La Ciudad Global, (Madrid, Ministerio de Trabajo de España, 1992)
inequalities and the need for greater education and technical skills among high-end service workers have bifurcated the labour pool of service providers, with greater informality accompanying the growth in demand for services (Sassen 2000; 1994; 1991).

The Nobel Laureate Joseph E. Stiglitz gives additional analysis to this phenomenon from the economic perspective. Stiglitz exposes how an “invisible hand” is currently managing globalization (Stiglitz 2002) He stresses the iniquities of the global economy, and the mechanisms by which developed countries exert an excessive influence over developing nations. Stiglitz exposes the issue of how globalization is currently camouflaged by “the vested interest behind many decisions” (Stiglitz 2006). In other words he seeks to show that the consequences of these misguided policies have been unsuccessful, not just according to abstract statistical measures but in real human terms through the marginalization of areas in the developing countries (Stiglitz 2002b). Inequality has not only been exacerbated within urban spaces and territories, but also between urban and rural-indigenous areas, making the contemporary Mexican context even more complex. Rural areas tend to be strongly aligned with cities’ consumption, locally and internationally. The effect of the agreement in encouraging a dramatic increase in trade and financial flows between Mexico and its NAFTA partners, and its impact on Mexican economic growth and business cycle dynamics, are documented with reference both to stylized facts and recent empirical research. In example, agroindustry exports after the NAFTA agreement had substituted local transactions of fruits and vegetables, making the international market more attractive. Statistics from the U.S. Department of Agriculture show that Mexico is by far the most important supplier of fresh produce to the U.S., accounting for 69% of U.S. fresh vegetable import value and 37% of U.S. fresh fruit import value in 2012. Total U.S. fresh vegetable import volume has increased at an average rate of 5.1% in the last twelve years -- almost double the 2.7% average annual growth in the volume of U.S. fruit imports -- according to the report (USDA 2012). Unfortunately the benefits are not shared within all sectors of the rural society.

According to Diane Davis this situation has driven more and more citizens into informality. Such employment, which barely meets subsistence needs for many trapped within it, is becoming ever more “illicit” as protectionist barriers drop, as fewer domestic goods for sale are produced, and as the globalization of illegal goods trade picks up the loose (Davis 2012).

Official statistics indicated that the share of the informal economy in the non-agricultural workforce ranged from over 55 per cent in Latin America to 45-85 per cent in different parts of Asia to nearly 80 per cent in Africa (Charmes 1998). The latest statistics of the National Institute of Geography and History shows that the informal sector today accounts for up to 59.1% of employment on average across the Mexican work force (INEGI 2013). The statistics indicate a continuous increase of informal employment, from 53.7% in 2009 to 54.6% in 2012.
Informal Globalization

Consequently, as a counterpart trend of the aforementioned scenario, which can be classified as the *formal path*, in many cities and isolated territories of rural Mexico an *informal trend* is also part of the equation. Organized crime groups operating in both spaces, urban and rural and fuelled globalization of consumption are involved today in a variety of illegal activities, ranging from drugs trade from south America to north America, military equipment trade from north America to south America, immigrants control from south America to north America, territory control, illegal minerals and wood exports, street markets contraband commerce, extortion, kidnaping, etc., just to mention a few of them (Buscaglia 2013; Davis 2012).

In other words mafias had been able to understand contemporary dynamics of market-driven liberalization as global trade opportunities as well. Consequently taking advantage of the mega infrastructures developed by foreign investment (NAFTA corridors and Ports) and operating global networks (Mexico-China, Mexico-South America or Mexico- North America); local mafias had been capable developing a collateral system under their own rules and territorial control which can be defined as *informal globalization*. This informal trend has been the main source of their economic financing. This set of operations has increased considerably their power in both the state and civil society in the last decades (Weinstein 2008).

According to Diane Davis these illicit forces often take equivalent role of mini-states by monopolizing the means of violence and territorial governance to local settlers in exchange for providing ‘protection’. Consequently, we can see that much of the current informal employment is physically situated within weak governability territories or informal settlements governed by violence and impunity. As a result an informal global trade of drugs, guns, and other contraband goods give mafias huge income to support illicit activities. Generally, mafias require its own “armed forces” for protection and contract enforcement in order to operate and control key territories. The illicit network of reciprocities, and the concentration of illegal activities in territories that function as complement domains, ‘outside’ of state control, further drives the problems of impunity, insecurity and violence in these territories (Davis 2009).

The final result is often the development of further clandestine connections between local-municipal police or gangs, and the informal sector in order to establish territorial control by their own paramilitary army. Consequently, the use of certain *isolated territories* as additional locations are key to support Illicit activities of informal globalization such as the case study located in the state of Michoacán Mexico discussed in the second part of this paper.
Isolated rural territories: supporting informal Globalization in Michoacán, Mexico

In the state of Michoacán these kinds of dynamics unfolded with a vengeance after the 2000s, when liberalization of the economy and segments of the NAFTA treaty produced a spurt of enthusiasm among investors and public officials willing to transform Michoacán into a global agroindustry exporter. The plan was to draw foreign investment in mega-projects that would transform Michoacán into the world’s leading agroindustry exporter through the door of NAFTA via the Pacific by establishing one of the most important port terminals there. The local and federal governments promoted many of these changes through international concessions and public-private partnership in order to “rescue” major sections of Michoacán’s economy. This was how the government has justified its actions to the people. Through the redevelopment of the renewed Lazaro Cardenas Port -- operated by Hutchison Port Holdings Limited -- and multiple motorway and railroad links to the North -- operated by Kansas City Southern Rail Network -- Michoacán had become part of an international NAFTA corridor. This was also promoted by North America’s Super Corridor Coalition (NASCO), a non-profit organization that seeks to develop an international, multi-modal transportation system along the International Mid-Continent Trade Corridor, which claims the new corridor will improve trade competitiveness and quality of life in North America. The project includes the largest border crossing in North America – the Ambassador Bridge in Detroit, Michigan and Windsor, Ontario – and one of the largest inland ports -- Laredo, Texas and Nuevo Laredo, Tamaulipas – and the ports of Manzanillo, Colima and Lázaro Cárdenas, Michoacán. It runs as far north as Edmonton, Alberta, Canada and Winnipeg, Manitoba, Canada. As a result, Michoacán has become an international agroindustry-leading exporter and the Lazaro Cárdenas’ Port Terminal is one of the top ten operating ports on the Pacific, serving the east and west coast of North America, South America and Asia (Berth Productivity 2014).

However along the aforementioned territories linked to formal global investment --in order to connect Michoacán state to the NAFTA Corridor-- it is also possible to find some of the most strategic or isolated territories where local mafias can easily operate in informal way. Formally, these territories are part of an international trade network of global supply chains with greatest concentration of goods and distributors bases such as ports and south-north/north-south commercial corridors. Informally, these territories are also part of illicit trade networks of global supply chains of drugs, guns, and other contraband goods taking advantage of Mexican strategic locations between north and South America and Asia-Pacific trade. This situation not only leads to a physical clash of forces and development models but to a space were new social conflicts are emerging. According to Diane Davis, this scenario further suggests that states are faced with the problem of how to manage and
understand their spatial division beyond formal and informal, urban and rural space but to acknowledge “safe” and “unsafe” territories (Davis 2012).

As a result it is emerging a new kind of Risk that goes beyond the traditional western discourses and sustainability and resilience definitions based on environmental crisis, climate change and constructive adaptation to such changes. What it’s developing is a new kind of Risk and social conflict generated through globalization down to the level of the community and individual. By understanding the social risk caused by an ideology, which meant to transfer responsibility for confronting serious problems, it also challenges to understand how responsibility lies in larger macro-economic forces and conditions. The purpose here is to suggest that adaption to such ‘Invisible’ and destructive forces are more likely to also take the form of resistance as a collateral effect to formal trends of globalization. It is already demonstrating to generate a certain form of resilience in the selected case study, but which it must be considered analytically (and politically) separate in both theoretical and practical terms.

Birthing Spaces of Risk as Social Conflict

As part of the global investment to align Michoacán with the NAFTA corridor, certain aspects of the economy such as Lazaro Cardenas’s port traffic and agroindustry had increased drastically. Today, Lazaro Cardenas Port is considered one of the most important ports of the country and one of the top ten Americas ranking port (Berth Productivity 2014).

In the last decade Michoacán has become the national and international leader of fruits and vegetables exporter, taking advantage of the favourable weather conditions, extensive arable land, plentiful water and cheap labour. 75 % of the avocados consumed in the middle and east coast areas of the U.S. come from this region. At the same time, Michoacán is a leading exporter in ten other agroindustry products, including berries, guavas, limes, mangos, and melons. As a result, Michoacán state is considered the “orchard of Mexico.” Another important sector, which is also growing very quickly, is national and international tourism. In the first years of 2000, touristic activity was increasing by 8 to 10% every year. However, attempted bombings by local mafias in the city centre of Morelia, Michoacán’s capital city, in 2006 and other ensuing events of violence have drastically disrupted this trend. In synthesis, it can be argued that despite these changes have lead to the development of new economic opportunities, these policies have also had negatively parallel effects. Land use practices have also suffered high speculation in both urban and rural areas.
Within urban territories such as the City Centre of Morelia, which is declared World Heritage Site by UNESCO, new business linked to global corporations had been able to put under pressure to local businesses causing its bankruptcy. Some of the loosed businesses and jobs had been able to find a fertile ground through informality. However, it is very likely that those, whom could not be employed or are limited within informality, have also been driven to a third stage finding illicit sources of income. The outcome has been that problems of insecurity and informality are intrinsically linked (Davis 2012). In peripheral urban areas, land under ejido property rights status had been suffering pressing speculation after de 1991 reform that allowed the privatization of communal ejido land. Substituting previous agricultural land for new real estate spaces of foreign investment had caused huge speculation and profit. Within the informal sector and informal settlements, the employment opportunities of the less privileged sectors of the population, namely those living and working in key physical sites associated with informality, has suffered.

In rural areas, agro-industrial exports and the need for more productive territories to grow fruits and vegetables are putting a lot of pressure on indigenous communities’ land (commonly ejido status), including forestry, water and other natural ecological reserves. For example, according to recently developed studies in forest cover change and land tenure change in Mexico’s avocado region, 33.1% of forest coverage was lost over a 16-year period. Within this region, two forestry case study communities lost 7.2% and 15.1% of forest cover, while two adjacent non-forestry communities lost 86.5% and 92.4%, respectively. Interview data showed that the Article 27 Reform combined with the 1992 Forestry Law led to a collapse of local governance, contributing to the illegal division of common forests and illegal logging in the two non-forestry communities (Barsimantova and Navia 2012).

In synthesis, new economic opportunities, goods exports and transactions have at the same time opened the gateway to new sources of funding to support illicit activities. New series of illicit economies have jumped from contraband and simple drugs to more sophisticated narcotics, security taxes added to all exports, extortions, etc. With capital accumulation, local mafias have been able to acquire more arms and legitimize their power by also investing in populations were they operate, creating complicity within the local community (Davis 2012). Consequently, gaining community’s support (commonly by pressure) has been translated into mafias’ access to local political influence and power control through municipal elections. As a result, weak municipalities have ended up as mafia-controlled territories for the expansion of operations as space of impunity, money laundering, and the use of public budgets to their benefit. What makes this state of affairs particularly paradoxical is the so-called interdependence of it all; many of the forces responsible for the conditions of crime, violence, and insecurity in both; urban and isolated
rural territories have themselves been empowered through globalization, albeit through a parallel network of global economic flows and activities than those responsible for bringing export-import market development. According to Davis this also highlights that **formal** and **informal** globalization are competing forces in direct conflict over the key urban and rural territories (Davis 2012). Consequently this phenomenon is producing **a new kind of risk** emerged as new spaces social conflict, violence and insecurity that now undermines certain areas of Mexico such as the case of Michoacán studied in this paper. In synthesis it can be argued that investment in agro-industry and restructuring of in Michoacán's formal economy to take advantage of NAFTA corridor; has also lead to the parallel growth of the informal and illicit economy in the region. But they are now locked in an unstable balance due to different conditions from the past. Today illegal/illicit has gained so much more profit and mafias has increased their power worldwide due to transformations fuelled by globalization.

**Globalization and Resistance: the Challenge of Social Resiliency of Self-defence Groups of Cheran Michoacán**

The aforementioned context suggests a paradox: the historical toleration of informality-illegality that may have created legitimate gains and thus stabilized the social, political and economic order in the past has also increased the power of local mafias to fight for control over urban and rural territories as mafias are part of the globalization of the economy. After a decade of operation within this framework, illicit groups under certain toleration and functioning in isolated rural areas of Michoacán were becoming more powerful every day. Consequently, local mafias were able to recruit and train young and ex-military unemployed in order to create their own armies supported by imported illegal weapons. With all their accumulated power, they were able to take control over different key territories for their transactions in both urban and isolated rural areas. Consequently, by 2014 experts suggested that the majority of the southern area of Michoacán was directly or indirectly under mafia control, (Althaus and Dudley 2014).

It is also in the same southern territories of Michoacán that different populations of native indigenous communities settled before the Spanish conquest. As is happening in hundreds or even thousands of rural communities, villages and regions, the inhabitants of Cherán -- an indigenous pueblo of about 15,000 inhabitants, the municipal seat and undisputed centre of Púrhepecha’s culture in the region -- were living under mafias control agony. Families and businesses were being extorted, attacks were everywhere, officials were corrupted, the people were threatened, and the community’s (collectively owned) forests were controlled and destroyed by bootleg loggers in collusion with drug traffickers. Every day dozens of
trucks carrying illegally stolen wood passed through the centre of the village. Whoever dared to confront the situation risked his or her life (Toledo 2015).

**Population of Cheran as Key Player in the Indigenous Rights Movement in Mexico**

Since the beginning of the EZLN movement in 1995 in the state of Chiapas, the population of Cheran, Michoacán have been active supporters and part of a The National Indigenous Confederation Network, hosting various national indigenous conferences and supporting the rights of indigenous communities. It can be said that Cheran has been a key player in the indigenous rights movement in Mexico. After suffering from violence and extortion from the local mafias controlling the southern territories including those where the entire population is composed of indigenous population. They decided to act --sick and tired of being under struggle-- leaflets calling people to action to each house, at 5:30 a.m. on April 11, 2011. Also the church bells rang and rang, as has happened on so many occasions in Mexican history. Women and young people predominated in the mobilized contingents. The first act was the detention of timber trucks and apprehension of the criminals. Self-defence patrols formed to set up barricades to control who entered and left the village and territories ignoring local authorities. In addition a key tactic was building *fogatas* (small traditional bonfires) as points of meeting, surveillance and resistance. At one point, 189 *fogatas* were counted. On April 29th, traffickers responded by killing two comuneros (members of an indigenous community), and, a few weeks later, four others comuneros were kidnapped (Toledo 2015; Salazar 2015).

Specifically, mafias were using the indigenous land to traffic illegal wood from the forest, to synthetize drugs using imported chemicals and maintaining illegal taxes and other sources of illicit revenue to their orchards production. Cheran’s citizens decided to organize themselves after long term-failed demand for justice to the government to tackle the mafia’s key interest. For two months the community remained isolated but united, developing an unprecedented process of self-organization, self-defence and, ultimately, self-government. By December 2011, a referendum decided the election without political parties, which were prohibited by agreement of the local population. Authorities were elected directly: a Council of Elders known as *El Consejo Mayor* was established, with twelve counsellors (three for each of the four *barrios*, or neighbourhoods) by invoking their constitutional right as an indigenous pueblo for self-government in place. It was the fist time that the concept of establishing self-defence groups was implemented in the state of Michoacán, and probably all of Mexico, taking advantage of strong local social cohesion of indigenous tradition.
From Self-Defence to Self-Government

As part of the strategy, Cheran’s leaders went further, developing a case in the Supreme Court of Justice of Mexico in which the population declared the Consejo Mayor de Cheran — elected by Habits and Traditions — as the only authority of the population. As part of the defence tribunal’s main argument to take power and control of the municipality it was demonstrated that the mafias had infiltrated and corrupted the local municipal police and government. The first tactical step according to an autonomy declaration on April 2011 was to get territorial control of all the margins of their population along to the municipal building to also substitute government functions. During this process, the people were supported by Colectivo Emancipaciones, a not-for-profit organization including historians and lawyers from UMICH based in Morelia, Michoacán, Mexico with the aim of supporting significant situations and liberal studies. Colectivo Emancipaciones played a key role in leading the defence process under the constitutional rights claim of native indigenous communities for self-determination. As a result, in May 2014 the Supreme Court of Justice declared the community of Cheran the first autonomous municipality of Mexico, which recognizes democratic methods, based on local indigenous tradition. Today El Consejo Mayor de Cheran is recognized as the sole municipal government with all rights to execute, develop and apply the rule of law and all its implications. This progressive step has been the milestone not only to set the foundations of a new governability framework to support Cheran’s capacity to recover readily from the struggle of social conflict in the region after suffering from local mafias suppression, but also to give them the basic tools for developing a future vision based on self-determination (Aragon 2015).

After achieving power, rather than organizing themselves into a bureaucratic municipal government as every traditional party would have, the community have been following their traditional ways of organization based on austerity, sharing of key decisions and resources, and rotation of power. Consequently, a key feature is that most of the members of El Consejo Mayor have also kept their main productive activities at the same time. They have other forestry and agricultural jobs besides being part in the government, so they are not “full time” politicians. The members of El Consejo consider their participation as an honorary appointment that is free of wages, redirecting all municipal budgets to productive activities. In a very short period of time this process supported by social organizations and national and international foundations, especially centres of education and scientific and technology research, have been decisive. In three years they have carried out around 40 research projects, including theses on such issues as forest management, communication, culture, education, land use planning, health and others. Their most evident achievements are the Community Patrols, undertaken by some hundred people, who have included the gradual
recovery of their forests by monitoring and innovative management techniques such as Radio Fogata (101.7 FM), operated by the community's young people, and the restoration of their forests. In the Communal Forest Nursery, tasks of gathering, germinating and managing the seeds of pine, oak, arbutus (strawberry tree), fir, chokecherry and other species are performed. Using agro-ecological methods, including an advanced robotic irrigation system, the nursery produces 1.5 million plants a year. Moreover, it provides permanent employment for 25 people and seasonal jobs for 140 others. In political terms Cherán has hosted numerous events, most notably a meeting of the National Assembly of the Environmentally Affected, a session of the Permanent Peoples’ Tribunal and a congress of some 100 communities in September 2014 (Toledo 2015; Salazar 2015).

Conclusion

In the face of the globalization system based in resources extraction which involves corporations, banks, governments, political parties, army and police, judicial authorities and so on, it becomes essential to acknowledge alternative models of ecological regeneration and social and cultural restoration led by citizens turning to alternative sustainability and resilience models redefined by local concerns. In Michoacán this resistance process to shake off a humiliating, marginalizing and tragic situation through citizen awakening and militant organization is an inspiring example to consider. Their experience is, of course, limited if not microscopic; still there is a lot to do. However, it has the virtue of having carried out local alternatives of what certain areas of the country needs to do to get out of the present situations of risk and social conflict. In this sense the feat is not minor. Cherán has carried out radical actions for a qualitative transformation, and it has managed to move from resistance and protest to establish the foundations of alternative vision. Unwittingly, as the Mexican ethno ecologist Victor M. Toledo suggests, “the people of Cherán have gotten underway a maxim that today is crucial: the crisis of civilization is overcome only by carrying out civilizational transformations” (Toledo 2015). In short, the adaption to such ‘invisible’ global and destructive forces, which took the form of resistance, generated a certain form of resilience and transformation, which must be considered analytically (and politically) in both theoretical and practical terms to redefine predefined concepts of sustainability and resiliency.

References


Notes

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2 In Mexican system of government, an ejido (from Latin exitum) is an area of communal land used for agriculture, on which community members individually possess and farm a specific parcel. Ejidos are registered with Mexico's National Agrarian Registry (Registro Agrario Nacional). The system of ejidos was based on an understanding of the Aztec calpulli and the medieval Spanish ejido (Gallup et al. 2003).
The Case for a Collaborative Energy Sharing Network for Small Scale Community Microgrids

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ABSTRACT Energy production is typically a regional enterprise, with the majority of energy produced far from the main areas of demand causing tremendous problems in terms of lack of resiliency and flexibility in handling the ever changing demands at the user’s end. On the other hand, microgrids as local energy infrastructures have offered resiliency by allowing neighborhoods to exercise greater control over the production of the energy they consume. As a system, the flexibility and resiliency that embodies the microgrid has to reside across all of its components and functions. Although microgrids integrate various techniques of automation, optimization, pervasive control and computation in its system, but equally important is addressing the human factors. Users, as an undeniable part of microgrid’s operational system, are thus required to act with respect to being resilient and flexible. By making all the information of every grid component accessible to the demand side via energy metering systems and feedback loops, microgrids play an important role in filling the gap of energy illiteracy, increasing user’s awareness and understanding about how energy is consumed in their homes and thus helping them to make informed energy consumption decisions.

Research on delivering high quality energy-related information on user’s activities and consumption rates signify the effectiveness of such information for inspiring and motivating users to change their behavior towards more energy saving ones but however the issue of making these behavior changes durable and integrated to one’s lifestyle, is still remaining a topic for further investigation. Accordingly this research attempts to encourage new ways of thinking about user’s engagement in the resiliency of their microgrid in terms of a collective process by combining computational means of feedback delivery with a collaboration incentive structure, requiring user’s self-organized participation in a shared-energy community endeavor.

KEYWORDS: Microgrid, User Participation, Collective Intelligence, Resiliency, Energy Management.

Introduction: Energy Crisis and the Creation of Smart Grids

The static electrical power grid is a significant dilemma of the 21st century and threat to resiliency. The extant grid was designed and engineered to generate electricity by localized power generators built around communities with clear boundaries between subsystems (generation, transmission and distribution) (Villareal, et al., 2014). The arising issue is embedded in the one-way flow of delivering power from central generators to a large number
of users handling only very stable outputs, without really considering the ever changing demands and fluctuations at the user’s end. Limitations of the grid in response to continuous changes of the dynamic environment, such as climate change and natural disasters, in addition to lack of engagement with users demand patterns has led to serious problems in terms of resiliency and flexibility (Kang, et al., 2014).

Along these lines, challenges as unprecedented rise for electrical power at the demand side and outdated investments in the power infrastructure, coupled with network congestions and atypical power flows across the distribution network, threatened to overwhelm the system and cause catastrophic blackouts (Amin & Wollenberg, 2005) (Farhangi, 2010). The need for resolving power grid issues attracted national attention by an announcement made by the IEEE Power Engineering Society in the 90’s (Werbos, 2011). The power industry recognized some mundane needs for upgrading the existing grid by placing a layer of computation over the infrastructure in order to solve the problem of lack of resiliency by deploying pervasive control and monitoring systems, data management, and communications among its different components (Folke, et al., 2002 - Farhangi, 2010). These basic ingredients accelerated utilities to benefit from various technologies as energy metering and feedback systems, simple sensors and communication networks ascribed at the power distribution and operation scale (Werbos, 2011). The context of these new technologies advanced the outdated electrical grid to a “smarter” grid capable of substituting energy and information among its components. The introduced “Smart Grid” is not known as a replacement of the existing electrical grid but a complement to it, coexisting with it and adding to its functionalities and capacities (Farhangi, 2010). Smart grids are known as the collection of innovative technologies allowing the fully integrated networking and communications of all generation, transmission and distribution subsystems and thus supporting the needs of its stakeholders by an efficient exchange of data, services and transactions (Farhangi, 2010).

**Microgrids and Resiliency**

Smart grids could be viewed as an ad-hoc integration of small groups of interconnected loads and distributed energy resources (Villareal, et al., 2014). In this view, loads are known as any device or mechanical system at the user’s end, requiring electricity for operation and are controlled via customer’s demand. Distributed energy resources (DERs) refer to decentralized energy generators which are typically constituted of renewable energy resources (including but not limited to solar panels, wind turbines, fuel cells, biomass and etc.) and distributed energy storage systems which are unique to each microgrid costumed by specific spatial and climatic constraints, utility regulations and incentives, and customer’s demand (Sherman, 2007). These small blocks of DERs delivering energy to a network of
users in a spatially defined area with clearly outlined electrical boundaries, are known as microgrids.

While energy production is typically a regional enterprise with the majority of energy produced far from the main areas of demand, microgrids as local community-scale energy infrastructures, allow neighborhoods to exercise greater control over energy production by generating energy close to the point of its consumption. Moreover, microgrids technically and simultaneously support the utilization of different renewable energy resources, providing security, reliability and resiliency under unexpected conditions of resource depletion or a rise on energy expenses, in addition to enabling the development of low-carbon energy technologies (Sherman, 2007).

Microgrids offer resiliency at the supply side by being able to operate autonomously while disconnected from the smart grid in “island” mode. On the other hand, if the consumption rate of a microgrid community is higher than its harvesting rate, the infrastructure could retreat its “island” mode and reconnect to the smart grid or other microgrids, and create a collection of networked microgrids by the existing transmissions lines and distribution systems in order to back up each other in certain situations. Additionally, by using information technologies microgrids are capable of predicting looming failures, taking corrective actions to avoid or mitigate system problems, and continually optimize the use of its capital assets while minimizing operational and maintenance costs (Farhangi, 2010).

On the demand side, by making all information of the grid components accessible to the users via energy metering systems, microgrids tend to engage users in the energy management of their system and promote sustainable and resilient lifestyles. That is, by empowering the users they set at ease optimal decision making relative to market, so users could adjust their consumption based on the time-of-day pricing of energy and reduce their consumption rate during the most expensive peak hours (Farhangi, 2010). Overall, microgrids are consistent with qualities of resilient communities - including diversity, redundancy, connectivity, modularity and adaptability (The Hurricane Sandy Rebuilding Task Force, 2013).

**Human Factors in Constructing Resiliency in Microgrids**

The embedded resilience and flexibility in the operation of microgrids has led to a substantial quality in tolerating the constant changes emerging in the electricity network area. The flexibility and resiliency that embodies the microgrid has to reside across all components and functions of the system (Farhangi, 2010). Microgrids have the capacity to integrate various techniques of automation, optimization, pervasive control and computation
in its system, but equally important is addressing the human factor. Microgrids attempt to offer resiliency at the users’ end, as an undeniable component of the system, via two-way communication technologies between the user and the grid. This communication is presented in the format of energy management by deploying advanced energy metering systems and the mere display of energy user’s consumption feedback information, giving users the ability to control their consumption pattern based on the energy pricing rates throughout the day (Ipakchi & Albuyeh, 2009 - Kang, et al., 2014).

Energy feedback technologies are based on the hypothesis that most people lack awareness and understanding about how their everyday behaviour affects the environment and therefore limits the consumer’s capacity to decide on taking conservation (Lutzenhiser, 1993 - Froehlich, et al., 2010). In microgrids, it is assumed that displaying energy feedback information at the demand side will increase the users’ knowledge on consumption which consequently leads to managing energy usage by adopting long lasting conservation behaviors; but studies have observed a nonlinear process of adopting greener habits while feedback delivery alone is not going to make people change their consumption behaviors (Hargreaves, et al., 2010).

Research on delivering high quality energy-related information on user’s activities and consumption rates signify the effectiveness of such information for inspiring and motivating users to change their behaviour towards more energy saving ones (Yu, et al., 2011). However, the issue of making these behaviour changes durable and integrated to one’s lifestyle remains a topic for further investigation. Researchers’ analysis on human behaviour in this context have shown that although displaying energy consumption information via visualizations is necessary and valuable in increasing awareness and helping consumers control their consumption, it is not enough in making long-lasting changes in behaviour unless it accounts for broader psychological, social and cultural patterns of household energy use (Aune, 2007 - Hargreaves, et al., 2010). That is because this information provisions are neutral through meters since they only display information, and they acquire meaning after going through each household’s interpretive and discursive lens, point of view and cultural practices. After information is processed by each individual, it brings in the ability of persuading people and solving the gap of “energy illiteracy”, but it doesn’t inspire them to adopt long-lasting behaviour change. In this regard, studies have emphasized the complexities of human behaviour by centering attention on environmental psychology literature for techniques and inspiration on pro-environmental behaviours and behaviour change strategies (Froehlich, et al., 2010).
Discussion

Researchers have approached the problem of promoting durable behavior change with feedback technologies mostly from a technological and psychological point of view.

Environmental psychologists argue that data can persuade people but it doesn’t inspire them to act. This means in the context of provoking conservation behavior and nudging users towards more energy responsive habits, giving feedback on consumption behavior is not enough in promoting long-lasting behavior change and is more effective when it is combined with other strategies like goal settings, incentive programs, economic penalties and etc. (Costanzo, et al., 1986 - Fischer, 2008 - Froehlich, et al., 2010 - Hargreaves, et al., 2010).

On the other hand, HCI researchers describe that users believe computerized devices are making lives more complex and frustrating rather than easier and more relaxing while they vary of the aesthetics, financial, and cognitive challenges that come with each new technologies. Studies in this category strongly recommend that the exploited technologies should not undermine people in their own home, and they need to be designed in a way to require human effort in ways to keep life mentally and physically challenging (Davidoff, et al., 2006). Requiring users to adapt to technology is very likely to fail quickly (Blumendorf, 2013).

One of the best references on the design of feedback delivery technologies or smart meters is conducted by Froehlich et al which documents the need for designing feedback technologies at the intersection of two fields of environmental psychology and human-computer-interaction (HCI). In order to resolve the issue of behavior change in metering systems and feedback technologies, authors strongly suggest that the two disciplines of HCI and environmental psychology learn from each other; feedback researchers and practitioners in HCI base their designs on the fundamental principles of longitudinal behavior studies explored by environmental psychologists, and then apply the unique methodologies and approaches found in HCI to advance the design of feedback technologies (Froehlich, et al., 2010).

Conclusion and Next Steps

The literature review explored in this study shows that for increasing the possibility of a resilient community to be energy responsive by its users, interpersonal psychology and HCI must be integrated. Toward this end, an energy exchange system – a collaborative energy sharing network for small-scale community microgrids - with a diversity of intense energy
users, structured on a collaborative incentive program with interactive and comprehensive energy feedback information is proposed as a possible solution.

In this system, HCI and energy feedback technologies work together for information and communication facilitation in the community. The focus of this system is on the users as the smartest component of the system rather than any so-called smart technological device. The coupling of feedback technologies with a collaborative incentive structure aims to help users perceive the personal and group benefits of making better energy consumption decisions. While users more or less consciously choose their activities and consumption patterns, they are the main influence and last instance for any decisions. Thus the operation of the energy exchange is designed to depend on user's tacit knowledge for a self-sustaining change in their consumption behaviour.

Further developments on this conceptual prototype requires defining the basis of the system as the first step and plan its principles and fundamentals. Consequently, the interface design takes place based on the outlined propositions, the incentives structure and characteristics of effective interactive feedback technologies. Delineating system's operation requires laying out the system's operational regulations as a policy framework to nudge users towards conservation behaviour by participating in a community-based energy exchange system, in addition to describing the system's architecture.

As a result of this energy exchange system, it's expected that new patterns of energy responsive collaboration and participation result in the community microgrid from user's themselves, suggesting resiliency in form of participants’ collective intelligence.
References


Blumendorf, M., 2013. *Building Sustainable Smart Homes*. s.l., s.n., pp. 151 - 158.


Notes

1 A very good qualitative field study done by Hargreaves and his fellow researchers in the UK have grounded this fact by studying how householders interact with feedback systems from different types of smart energy metering systems. The early assumption was that increasing feedback will increase awareness in household members and thus result in a change in behaviour. After analyzing behaviour and interviewing with the participants their observations show that almost all participants and family members got excited about the devices in the first place and started to change their energy behaviour towards conservation by adjusting their consumption based on hourly energy price. People got obsessed with their gadgets and monitoring devices when they first got it but after some time they just got used to it and their usage just fell off to almost nothing (Hargreaves, Nye, & Burgess, 2010).
Session 6

Pedagogy
ABSTRACT To contribute positively to systemic transitions within local communities, architects need to be critical, reflective, far-sighted communicators. This paper presents educational practices developing adaptive, systemic and co-creative approaches within the training of architectural Masters students. It evaluates the first outcomes of a four-year research through design studio, executed by the Academy of Architecture in Groningen, in which experiential learning helps development of heightened awareness, appropriate mindsets and critical thinking; enabling students to identify problems and challenges specific to their profession. Students, stakeholders, teachers and researchers involved in the studio form a learning community that critically monitors the educational program. By working on “live” projects, the studio produces insights concerning local scale energy transition in the North of The Netherlands.

Global issues urge fundamental changes in the Dutch energy system and recent accumulations of earthquakes resulting from natural gas exploitation in the region of Groningen make the ‘energy transition’ inevitable (Rotmans et al. 2001). Whilst alternatives, proposed by the Dutch government, mainly consist of isolated, mono-functional interventions (Boer and Zuidema, 2014), the studio investigates integrative systemic scenarios that seek to enhance resilience on a human scale by embedding the energy transition within local communities. However, systemic transitions may be unpredictable, as they tend to play out within complex spatial, social and economic arenas, involving multiple, multi-level stakeholders. Shove and Walker (2007) caution professionals, involved in long-term transitions, to remain critical during the “[continuous] cycle of problem-definition, intervention and response”.

Ziegler and Bouma argue that analysing is designing in the reversed direction. The first year’s outcomes consist of adaptive architectonic interventions within local communities, integrating flows of energy, food and waste. Using interviews with the learning community, the paper describes the educational processes leading to these outcomes, focusing on the formation and elaboration of the appropriate questions concerning stakeholders’ interests; how these questions are kept central and deepened throughout projects; how they are represented at their closure and, above all, how they renew awareness concerning future regional needs. Initial findings stress the necessity of a circular research through design process, not necessarily to solve, but to accurately define those needs.

KEYWORDS: Resilience; pedagogy; community of practice; research through design; experiential learning.
**Introduction**

Global issues urge fundamental changes in the Dutch energy system. Recent accumulations of earthquakes, resulting from natural gas exploitation in the region of Groningen places emphasis upon Rotmans’ (2001) assertion that energy transition is inevitable. In order to investigate the contribution of architects to this process, the Academy of Architecture Groningen is executing a four-year research through design atelier (studio) for architectural Masters students. This is a collaboration between the Dutch research group Future Urban Regions and knowledge centre NoorderRuimte (Hanse University of Applied Sciences). It approaches regional energy transition as an opportunity to enhance local resilience. The studio is in continuous development; teachers, researchers, students and participating regional stakeholders form a community of practice, critically monitoring the educational program. This paper evaluates the first year’s results.

Shove and Walker (2007) caution professionals involved in long-term transitions to remain critical during the "[continuous] cycle of problem-definition, intervention and response" (Shove and Walker, 2007). The education of architectural students does not yet adequately equip them to make positive contributions to systemic transitions and the spatial issues within these transitions are frequently complex and inconceivable; they occur simultaneously within different social-economic networks; they are identifiable through the interactions of diverse stakeholders, each with their own particular set of interests. The multi-disciplinary processes, through which the issues arise, are often protracted and complex by nature. The uncertainty concerning the problems and desired outcomes of such issues requires new methods of research and design. This paper focuses upon the following questions: What is the potential for energy transition to increase the adaptive capacity of local communities? Which skills does the architect need to enable local communities to increase their adaptive capacity and how can we educate architects to achieve the necessary professional profile?

**Resilient Communities**

Since the 1960’s the energy system in the north of the Netherlands has been relatively stable because of locally extracted natural gas. However, there is growing realisation, locally, that adaptation to changes in the energy system will be necessary if social, economic and environmental futures are to be secured (Coyle 2011, Müller et al. 2011). In fact, the regional energy transition initiates developments within which people are increasingly leading the critical appraisal and formation of their own community’s future. The new energy initiatives emerging from this process are not only focused upon the production of sustainable energy, they simultaneously attempt to have some, albeit minor, positive effect upon the balance of the globalised energy system. There is a quest “for alternatives with
more regional autonomy and possibilities for self-sufficiency" Schwencke, 2012:5). According to Coaffee (2010) involvement and empowerment of local communities is an important part of enhancing local adaptive capacity. Chandler (2014) states that developing a genuinely critical response to issues of power and governance has to begin by understanding how former assumptions about these issues are being challenged and transformed and by engaging with the emerging new common sense of resilience thinking.

Resilience conceptually describes the capacities of objects, organisms and individuals to engage in multiple, interwoven relationships. This paper makes use of this concept to describe a local community’s adaptive capacity. DeLanda (2006) conceives a local community as an assemblage; a source of interactions between heterogeneous components. Instead of stressing the function of each individual component; a human being, an organism, or an object, within a greater whole, DeLanda emphasises a component’s autonomy, as well as its capacities to interact. Capacities, he argues, are contingent and relational; they unfold within a specific time and place, in relation to other objects, organisms or individuals. Assemblages arise when these relationships form into recurrent patterns. In contrast to closed systems, assemblages are articulated by emerging possibilities and constraints. Assemblages are resilient because they can adjust to new circumstances by adopting unprecedented capacities.

The energy transition atelier carries out research through design to investigate the region’s potential, the obstacles and the capacities of its local communities and inhabitants in general. Students, stakeholders, tutors and researchers work together to expose and visualise these characteristics. The new role and skills of the architect are central within this process of research through design.

**Pedagogy**

Boer and Zuidema (2013) demonstrate that a significant part of energy transition emerges from the potential of a place and its local community. Therefore, at least part of the knowledge concerning energy transition develops “from the bottom up”. A “community of practice” seeking to expose and develop such potential concentrates a significant part of its research on local circumstances, knowledge and practices. Wenger, McDermott and Snijder (2002) define three integral factors that lie at the basis of a “community of practice”. An urgent problem necessitates: the development of new domains of knowledge; the formation of an experimental, living community within which new knowledge domains can be researched; the development of new practices within which domains of knowledge would logically integrate. The activities within a community of practice are directed towards the directly interactive exchange of knowledge. The formation of a knowledge orientated
assemblage takes place through the repetition of interaction. DeLanda (2006) proposes that the development of an assemblage is accomplished in two dimensions. The first dimension lays down relationships between content wherein the integration of new experiences and insights towards a shared body of knowledge, and expression, and innovative practices are the expression of this integration. The second dimension covers the tension within territorialization; the articulation and demarcation of the knowledge domain and deterritorialization; the expansion or transformation of this domain by new influences and ideas. Wenger, McDermott and Snijder emphasise calm and liveliness within a community of practice. This is expressed in the varied rhythm of mutual interactions, the difference between public and small-scale meetings, at different levels of participation by those involved, in a changing dialogue between “inside and outside perspectives” (Wenger, McDermott and Snijder, 2002: 51).

A regional community of practice forms around the energy transition atelier, on one side closely connected to its geographical context, on the other, maintaining a critical relationship with this same context. Gruenewald (2003) appeals for a critical pedagogy of place; for a learning environment that “connects place with self and community” (Gruenewald 2003:7). The pedagogy within this kind of learning environment is experiential, multi-disciplinary and dares to question accepted practice. The aim of this is to not only teach students how to understand their own context, but also to give them a broad and critical instrument with which they can take ownership of this context and transform it. Ellison (2009) proposes that, in this situation, tutors must be aware of their own stance, background and implicit principles.

In order to evaluate the studio’s educational processes and practical results, we will first clarify the research through design process in light of Kolb’s experiential learning theory. Subsequently we will describe three key moments in the students’ process of research through design, and analyse how the interactions of students and stakeholders contribute to the development of innovative insights concerning the region’s resilience, and to the enhancement of the students’ critical and inquiring capacities. Analysis is based upon observations, focus groups and interviews with students, teachers, researchers and stakeholders. Finally we will draw conclusions concerning our research questions.

**Experiential Learning - Research through design**

“Experiential learning is transformational, as concrete or abstract events are being transformed into knowledge” (Kremer, 2001: 226). Experiential learning theory, developed by Kolb, offers a framework for an experience orientated learning process. This framework consists of four stages; concrete experience; reflective observation; abstract conceptualisation; and active experimentation (Kolb, 1984: 30). The theory proposes that
these four stages must cyclically follow each other (Kolb and Kolb, 2005: 1). According to Kolb, a student learns by alternating doing and looking, feeling and thinking. Senbel (2012) emphasises that design education is characterised by integrated learning moments. Carmel-Gilfillen proposes that Kolb’s four stages of learning must be continuously brought together, one after the other, within an integrated design education (Carmel-Gilfillen 2012: 62). She proposes that particular attention should be paid to the development of analytical skills within architectural education. Furthermore, instead of separate development, these skills require integration within “creative, practical and theoretical” learning activities (Carmel-Gilfillen 2012: 62). The atelier aims to provide an experiential learning environment, within which the students not only gain concrete experience but are also offered the calm and opportunity to take ownership of these experiences and to make them part of their mindset. Experiences place issues within the “real-world” and make them concrete. The students absorb knowledge and theory, they train their analytical skills and use design to experiment and further conceptualise. They work on issues from different angles and at different scales. They develop knowledge interactively with the community of practice. The atelier integrates Kolb’s stages of learning within three educational phases:

1) Collective analysis and visualisation of the regional energy system and its potential for transition.

2) Collective energy scenarios for four separate locations representative of a cross-section through the urban, city-edge, village and rural areas surrounding the city of Groningen.

3) Individual, conceptual responses to location specific, spatial issues; strategic interventions designed to answer stakeholders’ concerns and to resolve aesthetic or architectonic issues.

The phasing of the atelier enables us to touch upon a methodology that integrates design and research. This form of research, defined by Frayling (2003) as research through design is in development. It appeared during evaluation of the atelier that the process of research through design would have to be more clearly defined during all of the phases. In the first phase attention to the quantity and complexity of the questions and issues posed to the students is important. Closer attention to the guidance and application of scenario development methodologies as tools for analysis and design during the second phase is also required. During the third phase more time and attention is required for reflection upon and evaluation of the potential value of the design interventions for stakeholders and the region as a whole. Annual reflection upon the research questions will take place in the atelier and in the work of attached researchers. In this way, each year we aim to deepen, build upon and pass on our knowledge.
Analysis of Key Moments

Ziegler and Bouma (2010) argue that analysing is designing in reverse direction. Analysis of the research through design process within the atelier takes us back through its different phases and directs us towards the new knowledge and skills of the architect within energy transition. DeLanda proposes that “a new skill deterritorializes”; a new skill or new insight “increase(s) one’s capacities to enter into novel assemblages” (DeLanda, 2006: 50). The analysis focuses upon three key moments occurring within three different project locations. They concern moments in the interaction between students and stakeholders that provided unexpected and transformative ideas; that raised questions amongst the students in respect of their own (project) process; and placed them in a position to learn to move within new assemblages.

‘Testing Local Energy Potential’ SuikerUnie, (phase 2 of atelier)

The SuikerUnie site is the derelict site of a primary sugar beet processing plant. Different extremes of focus were tested to explore its potential for local energy transition; local food production, organic water purification and the generation of renewable energy combined with green transportation solutions. The students developed a “portfolio of opportunities” orientated around the most fruitful combinations. The scenario methodology “allows us to imagine previously unknown solutions or developments” (Salewski 2011:16). It places stakeholders in a position to weigh and discuss possible futures (Salewski 2011:16). The question “what if” (this or that happened?) is central within this methodology. The municipal supervisor of urban design, reflecting upon this design instrument, wrote; 

[I]t teaches us that it is interesting to consider new ways of ordering (development) (interview 10.4.2015.)

‘Reconnect flows of energy, waist and water’ Lage Land, (phase 2 of atelier)

In search of a challenge and opportunities in the “Lage Land”, a rural location, one of the students had a conversation with a local farmer. A synthesis within the research through design process began from the moment that the farmer pointed out to the student the nearby waste and water purification plant.

Analysis reveals the connection between potential energy savings in the processing of waste and purification of water. A closed cycle approach results in proposals for the redevelopment of the nearby sewage treatment installation to transform it into a plant for the manufacturing of resources; also including production of green gas, food products (protein for cattle feed) and an attractive local educational and recreational facilities.

It is apparent upon reflection how strongly the combination of analytical skills with “creative, practical and theoretical” learning activities (Carmel-Gilfillen 2012: 62) can lead to
new insights. Material flow analysis and the systems approach helped to develop new skills that connected with new knowledge. A director from the organisation owning the sewerage installation and involved as a stakeholder emphasised the importance of the role of the architect: “It is good to think systemically. In this way, architects can play with form to create positive awareness, amongst individuals and communities, for the waste materials and foul water (that they generate) and in that way reduce their own costs” (interview with a director from Waterschap Noorderzijlvest, 01.05.2015.).

‘Intervene in daily Routines’ Zuidhorn, (phase 1 of atelier)

Shove and Walker (2007) caution that the often implicit visions of the future, that often form the basis of transition policy, seldom emerge from “ways of living or patterns of demand” (Shove and Walker, 2007:7). The students were invited during to a meeting at the Zuidhorn municipal offices in the centre of the commuter town of the same name. The event had been organised by local authority officers to allow them to make acquaintance with the issues and obstacles connected to the municipality’s sustainability policy (or vision). The students, who had until that moment concentrated, within the confines of the academy, upon the abstract scale of regional energy transition, had expected to finally make contact with local community stakeholders involved with real energy initiatives. There were, to their disappointment, no such stakeholders present. Unease was further created when it appeared that no such initiatives existed within the immediate area. The students put critical questions to the civil servants and councillor who were present concerning the realism of the municipality’s ambitions if they did not meet the needs of local residents. At the same time, the students also realised that they would have to reassess their own abstract concepts concerning energy transition and seek to address the issues of significance, with creativity, that intervened within the daily lives (needs, routines and practices) of local inhabitants.

“It is a matter of finding new methods for directing (development) with the new issues such as energy transition” (interview with the municipal supervisor of urban design 10.4.2015.)

The architect’s traditional domain is being deterrioralized under the influence of new challenges. Because of their unknown nature, perhaps inherent to all new challenges such as energy transition, design seemingly covers an apparently limitless space of possibilities within their context. DeLanda, building upon Deleuze, understands a space of possibilities as a virtual force field. The apparently limitlessness of possibilities in this force field are structured by tendencies or mechanisms. These mechanisms provide each separate design trajectory with direction. It is the search for new spatial mechanisms that will define the architect’s future domain. Each year the atelier tests these mechanisms to increase
understanding in the new role and skills of the architect. On the basis of our analysis, we provisionally differentiate the following guiding mechanisms that direct the issues connected with energy transition:

1) the needs, routine and practices within communities
2) cycles and flows of energy, waste, water, food and mobility
3) energy potential

We derive from these mechanisms that the architect’s new skills consist of learning to distinguish between the different needs and ambitions within local communities; critically and sensitively intervening within existing routines and practices; innovatively connecting and manipulating cycles and flows; testing energy potential.

**Discussion**

In evaluating the first energy transition atelier we have focused upon two research questions: What is the potential for energy transition to increase the adaptive capacity of local communities? Which skills does the architect need to enable local communities to increase their adaptive capacity and how can we educate architects to achieve the necessary professional profile? Based upon the process and upon the first results we conclude that the process of trying, within a spatial context, to save energy, as the first step of energy transition lead some students to a connection with the parallel need to close the cycle of material and resource flows within local communities. New relationships between these flows and everyday human practices contribute potential increases within the adaptive capacity of local communities.

Upon the basis of our analysis, we differentiate the three guiding mechanisms that direct the issues connected with energy transition. From this we derive a number of skills required by an architect if he or she is to contribute positively to transitions within local communities. A number of these skills can only be developed with the interaction of stakeholders, in a (self)critical, investigative and experiential learning environment.

The scenario design instrument finds a more central and key role in the research through design process of the second energy transition atelier. The usefulness of this instrument has put us on the trail of a fourth guiding mechanism, namely the paradigms that underpin the formulation of new spatial issues. We shall study this mechanism in our evaluation of the second atelier.
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Learning Comprehensive Building Design through a Resilience Framework
Michelle Laboy & David Fannon

ABSTRACT A framework for building resilience is critical to contemporary architecture practice, which is challenged to design buildings now that will first shape and then sustain a dramatically different and uncertain future. This framework is both a conceptual structure to define and organize characteristics of buildings as adaptive systems across physical and time scales (resilience as outcome), as well as a practical guide to organize design decisions and strategies that lead to specific solutions (resilience as a process). Students need this framework—both the theory and its real-life application—to learn ways design mitigates harm, nourishes life, and adapts to a changing world. Merging a lecture course with a design studio creates a cohesive pedagogy around problems of resilience, and provides critical context to the teaching of Comprehensive Building Design. The course Integrated Building Systems interrogates texts and case studies around issues of resilience to engage critically with conventions of design and construction, systems thinking, and ecology. The Comprehensive Design Studio uses real sites, integrated design and interdisciplinary collaboration to provoke the critical application of resilience principles and elicit design solutions for a complex environment of uncertainty and change. This framework reverses the traditional studio sequence, beginning with building systems rather than a program or a site, and emphasizing life-cycle sensitive design. Four phases overtly organize systems and design decisions from the more to less permanent, constantly shifting physical and time scales: from passive systems, to ecosystems, scenario-planning, and ultimately the synthesis and detailing of assemblies. Learning comprehensive building design through an ecological resilience framework emphasizes passive and structural solutions as the means to flexibility, durability, climate adaptation, reduced environmental impact, ecological integration, and human comfort.

KEYWORDS: Resilience, buildings, systems, integration, pedagogy, comprehensive.

Introduction
The potential of ecological resilience as a metaphor for building systems is best understood through the work of ecologist C.S. Holling, who differentiated stability, namely the “ability of a system to return to an equilibrium state after a temporary disturbance,” from resilience, which provides “a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships.” (Holling, 1973) This distinction, namely “shifting emphasis from the equilibrium states to the conditions of persistence,” is critical to understand that while engineering resilience is associated with stability expected of designed systems, ecological resilience is associated with dynamic...
living systems. As optimization-driven design fields become increasingly aware of the
dependence of designed systems on a dynamic and unpredictable environment, they find
ecological resilience a useful framework. This is especially true in architecture, which in the
last century has proved neither stable nor resilient, becoming increasingly vulnerable to the
effects of ecological deterioration and an ever more commodified environment, indeed the
“subject of short-term investment, income-generation, and resale, rather than life-long
dwelling or long-term city making.” (Benedikt, 1999) A renewed focus on sustainable
development and ecological restoration emphasizes designing long-life buildings as
elements of dynamic urban ecologies, and requires balancing optimization with robustness,
durability with adaptability. This is a provocative mandate for practice, one Holling might
describe as the “interplay of stabilizing and destabilizing properties”, between “two
contrasting aspects of stability: efficiency of function and existence of function.” (Holling,
1996).

Given this mandate, a critical intellectual framework for building resilience must
acknowledge that buildings are embedded in coupled social and ecological systems, which
are “sufficiently complex that our knowledge of them, and our ability to predict their future
dynamics, will never be complete.” (Berkes, 2007) As educators and researchers, we are
interested in resilience as a framework for “understanding how to sustain and enhance the
adaptive capacity in a complex world of rapid transformations” (Folke et al., 2002) and we
believe that we must engage architecture students in finding design solutions to these vital
issues of sustainability and resilience. There are two premises to a resilience framework in
architecture: first is the ambition that sustainable buildings—specifically their functions of
shelter and delight—should last a long time to justify the investment of ecological resources;
and the second is the risk that overly optimized buildings leave communities vulnerable to
changing social and ecological conditions. This seeming contradiction captures the
importance of learning to think critically about both the enduring qualities of well-designed
buildings, and about the assumptions made in designing them.

To promote that critical thinking, we developed a theoretical framework for building
resilience that applies ecological resilience principles to study the design of buildings and
landscapes as adaptive systems. Because resilience is both process and outcome (Ayyub,
2014), we propose that a framework for building resilience is both a conceptual structure to
define characteristics of buildings and landscapes across physical and time scales
(outcomes), as shown on Table 1, as well as a practical guide to organize design decisions
and strategies that lead to specific solutions for building resilience (process). Because
ecological resilience is multi-scalar, it requires a systems perspective for design: including
building components, building sites, districts, cities, and beyond. Thus resilience is not only a
critical topic for designers and students, it is a way of framing the broader issues of comprehensive building design.

The capstone course of the Architecture curriculum, the Comprehensive Design Studio, is the ideal place to implement this model. Unlike other studios that focus on specific skills, this studio challenges students at the end of their studies to integrate and synthesize their acquired knowledge into a comprehensively designed building and site. Students identify attributes that make buildings more likely to persist and adapt in the face of an uncertain future, and seek ways that each building can improve the resilience of its community. The studio is structured to engage systems thinking, to challenge traditional design processes, and to encourage investigations on form, materiality and performance.

Characteristics of the Framework

Resilience works across spatio-temporal scales. Resilient buildings must withstand short-term disturbances and maintain function, (engineering resilience of individual components) and persist in long-term trends (ecological resilience of complex adaptive systems). (Martin-Breen and Anderies, 2011) Tierney’s model of resilience, originally developed for seismic risk, provides a framework of Robustness, Redundancy, Resourcefulness and Rapidity, for resilience across different time scales. (Tierney, 2007) The same model identifies four domains of resilience Technical, Organizational, Social, and Economic (TOSE), which operate at multiple physical scales. While architecture often remains within the realm of the Technical, a critical practice must also understand how buildings engage other domains of resilience, as illustrated in Table 1.

Robustness: beyond shelter

The literature suggests that building codes focus on structural integrity and safety, rather than on continuity of function; suggesting resilient buildings as those exceeding minimum code requirements so that key building systems continue to function. (Jennings et al., 2013) This framework for ecological resilience not only investigates parameters to maintain functional and life-safety in short-term events, but also considers the qualities of long-life buildings that can sustain human comfort in multiple futures.

Redundancy: multiple paths to maintain function

Because resilience is the ability to maintain function in different conditions, the redundancy and diversity of systems improve outcomes in cases of failure. In this framework a main driver of design for building resilience is provision of multiple, integrated and adaptable ways to provide function (e.g. active and passive).
Rapidity: resourcefulness for response and recovery

Steward Brand argued for an "evolutionary design", influenced by changes in ecology and economics from "equilibrium-based" to "variance-driven" systems. (Brand, 1994) Optimizing buildings as singular responses finely tuned to program, site, and technology results in design "locked-into" particular pathways. The danger of a locked-in pathway is that "only a massive or radical shock or stress is enough to motivate path-breaking behaviours and changes." (Pendall et al., 2010, p. 75) This framework delays program, to prioritize comfort and delight, climate response and adaptability, and ecosystem services as drivers. It provides a life-cycle perspective to the design of buildings: considering design decisions from the more permanent (orientation, site, primary structure) to the less permanent (technology, weathering elements). It is critical to consider the effects of climate on materials, the environmental demands of future uses and populations, and future technological and social changes. A framework for building resilience needs to better engage the theory of impermanence (Ford, 1997), by designing for serviceability and weathering in buildings, engaging economic factors of material durability and designing "the proportion of larger, more permanent elements and smaller, replaceable parts" (Mostafavi, 1993).

Renewal: The theory of reality and the reality of theory

Critical of conventional practice that renounces theory, which "simply reiterates unstated theoretical assumptions" (Allen, 2000) we combined courses on theory and practice, a model typically seen in Science, in the teaching of what is otherwise pragmatic and technology-centered Comprehensive Building Design. The lecture course, similar to a natural history or ecology class, presents empirical knowledge, theories based on observations of the natural and built environment. The studio works as a laboratory for exploratory learning, in which students apply theoretical principles, experience the process of discovery, and document results to be evaluated by peers. In the Integrated Building Systems lecture, students explore theory and modes of practice that engage critically with conventions of construction, systems thinking, and ecology. The goal is learning how to combine critical theory and practice towards what Stan Allen proposed as "a notion of practice flexible enough to engage the complexity of the real, yet sufficiently secure in its own technical and conceptual bases to go beyond the simple reflection of the real."
Resilience in the Classroom and Studio

We applied and tested this framework over the past two years in the Comprehensive Design Studio. As a capstone course, this studio draws on the full-range of students’ architectural knowledge to satisfy accreditation requirements for the integrated design of a building and its requisite systems. We engaged resilience as both a topic worthy of study, and as a method to teach the other content in this course. Learning comprehensive building design through an ecological resilience framework emphasizes passive and structural solutions as the means to durability, adaptability, ecological integration and restoration, and human comfort. This significantly changes both teaching and learning.

Course Structure

The semester is divided into four approximately month-long phases; in phase one students develop structural parameters for passive building systems based on a given
climate. During phase two students are given a specific site for which they research the ecology, human history, infrastructure, and future human intentions across many scales of time and space. Using that understanding—and still without a building program—students develop buildings that emerge from and are grounded in the current and future site and infrastructure, rather than simply on them. In phase three, students methodically address uncertainty by using scenario planning to design the building (and constituent systems) for multiple future uses and contexts. In the final phase four, students develop the assembly of their projects to a high level of detail: ensuring a comprehensive design with both breadth and depth.

Perhaps no other change is met with more curiosity and questions than the decision to essentially reverse the sequence of the studio, so that rather than a program or a site, it begins with building systems; their performance and relative permanence. When students approach buildings systematically, the structural, envelope, comfort, site, and other building systems are generative, and drive the initial formal and functional parameters of the design. Over the course of the semester, each additional element of design—site, program, material, or detail—is introduced as a system itself, and a part of the overall project’s “system of systems”. Thus rather than any one element of the project becoming deterministic, or forcing students to optimize the design for one set of conditions, each new element offers new components of the ecosystem, and also new connections to the existing elements.

Each phase of the studio not only steps towards a fully-developed project; it focuses on specific course content (e.g. site and landscape design, MEP systems) while connecting the design effort a particular aspect of the resilience framework (e.g. future programmatic flexibility). We provoke these investigations with specific learning activities and teaching approaches. The result is an integrated pedagogy for integrated design, as illustrated below.

Systems As Focus

In the first phase, students adopt a set of strategies for three major building systems: structure (e.g. load-bearing masonry, steel frame), enclosure (insulated panels, curtainwall) and comfort, and look for ways to integrate those systems into a resilient building. For buildings, ecological resilience is of course metaphorical (Pendall et al., 2010), but the idea of preserving relationships in the face of change is quite applicable in the design of buildings, because it encourages students to think of buildings as the integration of physical systems to achieve performative (but not necessarily physical) ends. We encourage students to think about these relationships as parameters, for example, there is a geometric relationship between the physical dimension (height) of a window and the penetration of useful daylight for a visual task, while there is a material relationship between the construction of a wall and its thermal resistance. Students identify the parametric
relationships inherent to these systems, and the possibilities for and limitations on the spatial, structural and environmental performance criteria. This approach deliberately foregrounds the longest-lived parts of buildings, like structure, in the face those that might be fleeting, the occupants and their furnishings. If we consider buildings as systems of systems (and embedded in larger systems of site and infrastructure) the integration of sometimes the complex reciprocal relationships between building systems and building performance over time presents the fundamental task of resilience.

Site investigations across time and physical scales

In the second phase, students are given a specific site. Buildings link to a whole ecosystem of the built and natural world, so the first task is site research across many scales. These investigations are often rich in their own right, and fruitful generators of form. Students discover that urban buildings are not self-sufficient islands but depend on a network of urban systems, and in turn those buildings shape resilient communities, now and in the future, a deeply ecological understanding, based on the notion of dynamic equilibrium, not stability. Students design such that the site becomes an integral system to the building, and the building become integral to and transformative of its topographical, climatological, ecological, cultural, and physical context now and in the future.

The Future-Buffered Building

The third phase of the studio introduces a host of possible programs that might occur over the life of a building. While it is impossible to predict the future, as architects our students will be asked to plan for it; and those designs will meet current and anticipate possible subsequent uses and conditions. To address the uncertainty, we introduce the tool of scenario planning to the students, who undertake a self-facilitated exercise as a group, with some faculty guidance on process and data, but growing out of their deep understanding of the site and forces. Structured scenarios have been identified as useful tools for resilience-building by “envisioning alternative futures and the pathways by which they might be reached” as well as identifying “actions that might attain or avoid particular outcomes.” (Folke et al., 2002) Because the resilient building is about what it does, not what it is, scenario-planning leads students to a series of possible futures for the building, and an approach to flexibility that allows their buildings to thrive in each of those future states.

Students must design buildings that can transform efficiently to meet unknown future spatial, structural, and energy needs, and in response to a changing context and environment. These future uses are often developed spatially (i.e. the contents fit in the building) but must also work systematically (e.g. structural and thermal loads, integration
with comfort systems, appropriate fenestration). As the uses and layouts become ever more
real, students refine the active systems (which use energy to overcome the limitations of the
passive parameters). The goal by the end of this phase is that students have a design that
successfully integrates building use and building systems for multiple possible futures.

Using skills to merge theory and reality

The Comprehensive Design Studio is about understanding architecture’s physical
manifestation: buildings built in space out of real materials and subject to real forces of
physics, chemistry and biology over time. Throughout both courses, we invite guest experts
to provide “reality” as well as subject matter content, from details of integrating structure or
HVAC systems, to the possibilities of prefabricated façade systems, and the integration of
building and site water management systems. Similarly, resilient design is both a technical
and cultural proposition, grounded in the real world and highly relevant to, and reliant on, the
world of practice. Drawing on many practitioners from diverse disciplines as critics and
consultants, and working on vulnerable local sites, prepares students for new modes of
practice in complex environments of uncertainty and change. Emphasizing collaboration,
students work in pairs, and each pair will have at least three consultations with experts like
structural and mechanical engineers, envelope consultants, and landscape architects. The
confrontation of the real world of a specific site, of proper details, of durable and reparable
systems, informs—and in some cases constrains—the design.

Conclusions and Future Work

The quality of coursework and anecdotal feedback from students and guest critics
suggest that a Building Resilience framework is a successful model for teaching
comprehensive design. The next step is a systematic learning-science study of student
outcomes of this approach, and to measure the impact of resilience education on practice
after graduation. We are engaged with colleagues from landscape architecture and
engineering to explore ways the resilience pedagogy might enhance integrate the capstone
experiences in the various disciplines.

The continued refinement of the resilience framework through coursework serves as an
important testbed for new resilience metrics being developed by the authors support from
our home institution, the National Science Foundation, and from industry. While these
metrics ultimately serve practice, they first grow and develop in classrooms, just as
practitioners do: as part of a critical pedagogy to shape and sustain those who will design
our future world.
References


University-Based Rural Sustainable Development Assistance Strategies

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ABSTRACT Approximately half of China’s current population resides in rural areas, which are rapidly developing over the past few years. Nonetheless, over 100 million Chinese are still living below the national poverty line. China cannot achieve sustainable development without the progress of its poor rural areas. Accordingly, with their expertise, knowledge, and human resources, universities must support the sustainable development of such areas. In this study, the features and experience of university-based rural development programs in China and other countries are reviewed. The challenges encountered by the poor rural areas of China and their sustainable development model are then discussed. Consequently, a series of strategies for implementing university-based rural program in poor rural areas of China are proposed by considering both the international experience and the current Chinese situation.

KEYWORDS: Rural sustainable development; university-based rural development programme; experience and strategies in China.

Introduction
Rural sustainable development is a crucial issue in achieving sustainable development, particularly among developing countries. Different organizations, such as the government, charities, and research institutions, have significantly promoted rural development for many years. Among these organizations, experts and university students are becoming increasingly involved in rural sustainable development assistance programs (rural development programs for short). However, several universities and experts in China do not realize their advantage and responsibility in implementing rural research and practice. The number of systematic strategies and effective network of university-based rural development projects in China is remarkably insufficient. Therefore, this study reviews different kinds of university-based rural development projects in China and other countries by considering the current situation in poor rural areas in the former to introduce some useful strategies for the proper implementation of Chinese university-based rural development programs.
University-Based Rural Development Program

Review of University-Based Rural Development Program

Numerous universities in China and other countries have established their own rural service or research programs, which can be divided into several types according to different classifications as listed below.

- **Service and research programs**

  Rural service programs usually organize students to volunteer and conduct community improvement projects such as building construction, infrastructure improvement, and teaching support. For example, Public Service Center of the Massachusetts Institute of Technology is a service program which offers numerous public service projects includes providing Ugandans with computer access and promoting renewable energy in rural Cambodia (MIT Public Service Center, n.d.). Rural research programs establish a research center or institute that applies the expertise of professionals to implement systematic and long-term research projects in rural areas. Canada has seven university-based rural research centers, including the Rural Development Institute (RDI) of the Brandon University, which conducts multidisciplinary academic and applied research on rural issues. (About RDI, 2014).

- **Short-term and long-term programs**

  Various university-based rural programs are often one-time programs with a simple objective and therefore last for only a relatively short period. The entire process of these projects, including site investigation, design, preparation, and implementation, normally take less than three years to accomplish. The Estudio Damgo (Dream Studio) of the Foundation University in Dumaguete, Philippines is a short-term program which provide architectural students with hands-on experience using native, sustainable, and alternative materials to construct their own design with support from the community. (Villanueva, 2012). Long-term rural development programs focus on helping one rural community or rural region for several years, during which they aim to establish a solid relationship with local residents, improve the quality of life in the area, and even provide policy recommendations. The Rural Studio in Auburn University is an extremely successful long-term rural program established in 1993. The program offers architecture students a more hands-on educational experience while assisting an underserved population in Hale County, West Alabama. This program has developed more than 150 projects and has educated more than 600 “citizen architects” (Purpose & History, n.d.)

- **Single research field programs and multidisciplinary programs**

  Certain rural programs only address one research field. For instance, the above-mentioned Estudio Damgo and Rural Studio are focused on the architectural field.
Another example is the Continental Crossings, a civil engineering student organization at the University of Iowa founded in 2006. This particular organization concentrates on designing and constructing rural bridges (Continental Crossings, n.d.). Multidisciplinary rural development programs integrate experts from different fields to contribute to rural development from different aspects. An example of this type of program is the Rural Education Action Program (REAP) of the Stanford University. REAP involves numerous experts from different fields (e.g., economics, political science, psychology, and public health) to work under diverse research projects with different theme areas (Theme Areas, n.d.) to inform sound education, health and nutrition policy in China.

Questionnaire Survey of International Experience

An online questionnaire survey was administered to investigate further the international experience of university-based rural development programs. The questionnaire was sent to the organizers and participants of rural development programs in 23 universities in different countries. Of the 38 respondents who completed the questionnaire, 42% were leaders, 29% were core members, and 29% were participants. These respondents had specializations in architecture, urban planning, civil engineering, public health, law, sociology, economics, and psychology. The number of respondents might not be remarkably huge, but it covered a wide range of roles and specialties. In fact, a few comment features and challenges of university-based rural development programs could be drawn from the results of the survey.

Among the listed challenges faced by target villages, low income was determined to be the most commonly experienced challenge. Low level of education, mountainous areas, minority areas, and low living environment quality were identified as other major challenges (Fig. 1). Some respondents also added limited infrastructure to the list of challenges they encountered. This finding demonstrates the common features of disadvantaged villages with vulnerable groups that should benefit from rural development programs.

Fig. 1. The main challenges of target villages of rural development programme.
In the face of these challenges, rural development programs have attempted to provide services and conduct research to benefit rural residents. The respondents believe rural residents can gain significant benefits, including knowledge and information, esteem and identification, long-term connection with experts, self-confidence, and living environment improvement (Fig. 2). The first four benefits are helpful for villages located in minority areas and have low level of education. In contrast with material assistance, these “soft” benefits could provide remarkable long-term effects through the improvement of social sustainability. The fifth benefit is significant for villages located in mountainous areas and have low living environment quality. Such a development could be realized efficiently by architectural experts and students. Therefore, the involvement of architectural experts and students is conducive to fostering direct improvements in rural life within a short period.

![Fig. 2. Benefits that rural resident can get from rural development programme.](image)

Rural development programs could also benefit universities. The results of the survey revealed that most respondents considered the largest contribution of rural development programs is that they allow the universities to provide social services, thereby reinforcing their social responsibility. Rural development programs can also have significant benefits for university students by providing them with practical education and training. Universities can also gain further opportunities for interdisciplinary exchange and collaboration with other outstanding universities. Universities may also acquire remarkable research achievements, attract more funding, and could even earn rewards (Fig. 3). Therefore, rural development programs are not only a program that offers certain commodities, but also a program that could benefit rural residents, university students, and experts.
Fig. 3. Benefits that university can get from rural program.

Rural development programs cannot be implemented easily. The outcome of the survey illustrated that such an implementation is commonly challenged by the “lack of evaluation standard,” “complicated local logistics,” and “founding limitation”. Therefore, improved time management, systematic implementation strategies, and support from the international network could benefit significantly from the implementation of these programs. The team also requires interdisciplinary expertise, scientific research method, and support from the local government (Fig. 4).

Fig. 4. Main challenges that university teams met in rural program.
Experience and strategies of The Chinese University of Hong Kong

Situation and problems of rural China

The main challenges that poor rural areas of China faced are similar with the survey result above mentioned. Most poor rural areas of China are mountainous areas where villagers experience difficulties in going outside for education, health care, purchasing needs, and trading goods. Although this closed living environment has assisted in the preservation of several unique minority cultures, it has also abetted the relative marginalization of the minority groups (Chen et al., 2007). China implemented the New Countryside Construction policies in 2005 to solve these problems (eds Qu et al., 2006). In some flat rural areas near the cities, this modernization development model significantly improved rural life and urban-rural integration (Zhang et al., 2010). However, practice has proven that the urban-rural integration development model is only suitable for 5% of the rural areas, which are located close to urban areas. (Qiu 2009). The said model is unsuitable to poor rural areas. Problems have emerged in the process of implementing rural development. A considerable number of rural residents have chosen to migrate and work in urban areas, leaving behind the elderly and the children (eds Li et al., 2008). Thus, these mountainous rural areas have lost a strong and cohesive force and have become a symbol of “backwardness”.

Sustainable rural development model of rural China

In Europe and other developed regions, a critique of rural modernization that focuses on the problems of over-production, environmental degradation, and spatial inequality has been proposed as early as the 1970s. This action has led to the conceptualization of a new rural development paradigm that departs from the modernization paradigm. The new rural development paradigm is characterized by a shift in the emphasis from “inward investment” to “endogenous development”, from “top-down approach” to a “bottom-up model” in relation to the mode of delivery for rural development, and from “sectorial modernization” to “territorially based integrated rural development” (Woods 2011). Local bio-capacity and cultural context serve as basis of the new rural development. It focuses more on food localization, traditional craft industries resurrection, sustainable exploitation of resources, and social capital improvement. It compensates for the inconvenient transportation and insufficient financial capital, makes full use of local resources, limits environmental impact, respects local culture, and benefits human development (Woods 2011). Clearly, this paradigm is appropriate for poor rural areas which have inconvenient transportation and low levels of development. It is suitable to the aims of improving the quality of rural living environment, maintaining the vigor and the cohesive force of the poor rural areas, and increasing life control of the rural residents (Caraveli 2006).
One University One Village programme in The Chinese University of Hong Kong

Our research team has almost 10 years of experience in rural construction and development project in western China. The first rural project we completed is an eco-school in Gansu Province (Ng et al., 2007). Our “high-science and low-technology” strategy provided a successful solution to local residents. However, we realised that long-term rural sustainable development cannot be achieved only by building construction. In the post-earthquake reconstruction project in Sichuan, China, we spend several years in one village, employing multidisciplinary strategies in a systematic way. The outcome shows that rural life could be significantly improved through this model (Wan et al., 2011). Based on these experience and our understanding of the rural situation and problem in China, the concept of rural sustainable development and rural development programs in the international context, we launched the “One University One Village” rural sustainable development assistance program (1U1V) in 2013 (One University One Village, 2015).

The 1U1V aims to combine the expertise, knowledge, and human resources of “a university” to improve the livelihood of “a village” and its disadvantaged villagers in a strategic, systematic, and sustainable manner. The 1U1V initiates university collaboration, multidisciplinary collaboration, and resources combination to maximize the advantages of “one university”. In this program, we first identify a need such as an existing problem in poor rural areas or response to disaster. Consequently, we bring together the expertise, knowledge, and human resources of “a university” and collaborate through government consultations and local involvement to seek a solution for the problem determined. In response to the challenges of poor rural areas, our solution follows the new rural development paradigm, which is based on tradition and research innovations and applies high-science and low-technology strategies. The implementation of the program is a bottom-up innovation with community union to promote local and sustainable development. We believe that long-term and fixed support could help us understand the situation and needs of a village better, allowing us to establish a strong relationship with them and to provide them with systematic and efficient long-term support. We are also conducting a series of studies to establish the assessment system of sustainable rural construction and development (Wan et al., 2014). With the research outcome and demonstration project, we can present the necessary policy recommendations and assessment standards to the government.

We are currently conducting two projects in Yunnan Province, China. The first site is Qiunatong village, a Catholic village located in northwest Yunnan near Tibet, which is a mountainous area. The majority of the locals in this area are Nu minority. Qiunatong is a poor village with an annual per capita income of 1200 yuan. We have organized multidisciplinary experts from five universities (the University of Cambridge, Stanford
University, Peking University, Kunming University of Science and Technology, and The Chinese University of Hong Kong) to provide the following scope of works: 1) Safe and comfortable living environment; 2) Heritage and local culture; 3) Health and well-being of villagers; 4) Waste and pollution control; 5) Improved rural education; 6) Local economy activation.

The second site is Guangming Village, also a poor mountainous rural area located in northeast Yunnan. On 3 August 2014, this area was struck by an earthquake. After that, the villagers lost confidence in traditional rammed-earth buildings and therefore became eager to have anti-seismic, cheap, and comfortable houses. In collaboration with the University of Cambridge and the Kunming University of Science and Technology, our team commenced the reconstruction project of the village on October 2014, designing low cost anti-seismic buildings with traditional technologies and enhanced living environment. Apart from conducting reconstructions, we also sought to provide a demonstration for the local government to formulate reconstruction strategies. In mid-January 2015, we conducted a seismic experiment for 1:1 abode brick wall and rammed earth wall houses (Fig. 5). The results of the experiment verified that both structures have good seismic performance. The main construction work for the first demonstration village house was completed on 10 February 2015 (Fig. 6). More reconstruction work will be launched soon.

Fig. 5. Seismic experiment.

Fig. 6. The first demonstration village house of Guangming Village.
Conclusions

Although China’s urbanization is fast, its rural population remains large and is projected to increase annually. Rural areas must establish their own development model instead of merely following the urban/modernization model. The government must also encourage the realization of autonomous, diverse, endogenous, and sustainable rural development. In recent years, the Chinese government and other organizations have allocated considerable funding and materials to the country’s poor rural areas to support their development. However, substantial constructions have not addressed the problems in rural areas in China. The most significant support that rural China requires is neither funding nor materials, but innovative ideas and systematic strategies. These rural areas also require multidisciplinary research and systematic consideration, which can be provided by universities. China has over 2000 universities, which could provide support for sustainable rural development. If one university could support one village, then the quality of life in rural areas of China could be improved significantly.
References


Architecture of Multiple Authorship: Beyond the academic year

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ABSTRACT The research is based at the Cass. School of Architecture, London Metropolitan University, and examines socially engaged live projects within the school's design studio. As deadlines of live projects with real collaborators and partners are not defined by the academic calendar, the studio involves different student cohorts over several years during different phases of a project, ultimately enabling an on-going live and adapting engagement with a place and its community. The paper suggests a new structure within the academic institution, which sits between academia, practice and the city. Every year, the participating students learn a different skill driven by the city and its environment, however, always in relation to previous cohorts’ activities whose work they take over to develop while it evolves. Not only do the students benefit from working on projects with continuous involvement in a specific place, but the ongoing engagement with a place also empowers communities and influences the profession of the architect. Students gain a presence in the place and establish new networks amongst communities, all required to make comprehensive and often radical changes within the city, which include physical as well as social designs. This experience equips students with a skill-set to develop self-initiated projects. As a result, the paper proposes reducing the current education from seven years to an EU competitive length of five years, where the practical year-out experience recommended by the RIBA occurs during the academic education through attending the Live Projects Studio. In order to discuss this method of teaching, the paper focuses on a case study situated in Hayes, West London, which started in 2012 and is currently ongoing.

KEYWORDS: Architecture live projects; on-going projects beyond academic year; student experience; new forms of practicing architecture; shortening architectural education; self-initiated projects.

Introduction: Live Engagement with the City and its Inhabitants

This paper is based on a research initiative at the Cass. School of Architecture, London Metropolitan University, which explores if we can develop socially engaged live projects as part of the architectural education within the undergraduate design studio. It describes projects which, in order to be successful and in contrast to common academic practice, run over several academic years. The participation in these projects, both for tutors and students, suggests an alternative way to the common architecture education based on
hypothetical cases and constructed in the classroom. Herein, students look at social and political conditions from a distance and only take a speculative angle without real engagement with the city and its inhabitants.

In contrast, the studio focuses on real projects, which are of public nature and often located in deprived areas with non-paying communities as their “clients”. These live projects are close to the practices of socially engaged art, described as typically being delivered “through collaboration, participation, dialogue, provocation and immersive experiences … [with] focus on process and [seeking] to embed themselves within the communities among whom they work.” (Froggett 2011). All live projects within this studio are defined by a continuous relationship between the students and shifting members of a community group, traditionally called the “client”. These live projects do not have a singular commissioner but their client body is made up of a network of partnerships between local community members, local stakeholders, our students and the tutors. The traditional role of the architect as a service provider - “Agent operating for” - moves towards an architect who becomes collaborator and partner - “Agent operating with” (Petrescu 2012). Through local engagement at a human scale, students acquire the tools to plan resilient architecture. As students do not act as “service providers” and are encouraged to experiment, these projects are best placed within the university context where students are offered opportunities to be involved as part of their studies and are supported by university funded academics, who are professionals as well. The research has shown great benefits for projects and communities. If care is taken to meet the learning outcomes each year, the benefits are for students alike. In addition, this method of teaching could be a respected new pathway of becoming an architect, recognized by schools of architecture and the RIBA.

Case Study Project: Re-imagining Hayes

The paper presents a project situated in Hayes, West London, which started in 2012 and will be continued into the academic year 2015-16. This case study demonstrates how a community project can be run over several years, adapting to changing conditions, and benefitting both the communities and students. So far three student cohorts worked on different phases of the project, each year redefining and developing the year’s brief, questioning the scope of work, finding their “clients” and discussing the architect’s continuing responsibility in the public realm. In the first year, the focus was on making. Students constructed a 1:1 Mobile Hut and explored social enterprise potentials in Hayes. During the second year, students concentrated on developing the programmes which go with architectural structures and are supported by local communities. Students organized a series of events, which gave rise to the creation of different clubs and fragmented building proposals on a local housing estate, the Austin Estate. In 2014-15, the students moved to
the High Street in Hayes in order to ensure the continuation of the successful programmes developed in the previous years and to expand participation to a wider community, with the emphasis on making building proposals for the High Street. In 2015-16 we will be working with Hayes Town Partnership and focus on one of the successful proposals situated on an industrial site beside the canal in order to develop design options for a canoe club.

**Academic Year 2012-13: Made in Hayes - Identifying the Stakeholders**

Some will have seen the orange Mobile Hut in the different London locations; first in Hayes, West London, in front of an unused community hall. The corrugated transparent structure with an orange membrane shining through, contrasted surprisingly well with the faint yellow corrugation of a large rundown shed as the backdrop. As an indication for ongoing change in Hayes, this shed has now been replaced by porter cabins, which are used as community rooms. Hayes was the first location where the students based their self-built structure, the “Mobile Hut”, in order to explore social enterprise potentials opposite the Austin Estate. These enterprises included paper works, soap and candle making etc. In contrast to local preconceptions, the students saw that the Austin Estate has active and interested residents. They challenged the local residents through a series of “making” events and developed next year’s agenda for the following student cohort to work on, re-imagining a town hall for the estate. After travelling to Hayes, the Mobile Hut went back to its second location on Holloway Road, Islington, to be part of the Architecture Cass Summer Show and a few days later to the opening of the Art and Design Cass Summer Show in the Aldgate location. Even when the academic year had ended, the students’ showed continuing engagement. They set up a small exhibition inside of the Hut showing the results of the year’s work as part of a larger project in Hayes to be continued by a new cohort of students.

Covering all learning outcomes during the academic year, students designed a mobile room for a real client, a group called “Friends of Abbey Garden”, who paid for the construction materials and are now using the Hut. In addition to the conventional skills students acquire in the design studio (e.g. design process and representation), this cohort learned about presenting their work to a real client, which differs from presenting to an academic audience. Student feedback has shown that particularly the weak students thrive and find reasons for doing well when confronted with real clients and 1:1 making of a project. We also tested a larger office situation, where student teams took over the designs from other students for detailing. They went through all working stages in order to jointly build the structure at 1:1. This project of “Multiple Authorship” taught the students that “detail matters” and encouraged great team-building skills.
Academic Year 2013-14: Re-imagining a Town Hall for the Austin Estate through Events

The positive response in the making workshops by the local residents of the Austin Estate initiated the exploration of the traditional building typology of a town hall against the contemporary context of the ethnically and culturally diverse housing estate and its fragmented residential community. Students gained trust of the community by continuing what the previous students had started, organizing more events - this time directly on the estate - and exploring potential programmes in order to actively engage the residents. These programmes, which derived from local interests - such as making music (Fig. 1 and 3), playing chess, sewing - became very specific to the locality.

The activities were not the aim in itself, but a platform to trigger participation and identify local interests to grow future programmes to inhabit resilient architectural spaces. In Hayes, the events lead to the creation of different clubs on the estate, a youth band, a board game club and most successfully, a sewing club with growing popularity beyond the Estate and the academic year. The students learned that the success of these clubs were effective settings for resident gatherings, debating about public life and their needs. They discussed the architect’s continuing responsibility of their projects in the public realm and how to hand-over responsibility for the clubs to the residents, or – if not yet possible – to the next student cohort. Students not only developed their own briefs, but they gained confidence in taking initiative to fund the realization of their ideas. Student Susan Kudo successfully applied for a council grant to support the Sewing Club. Her project continued over the summer with the Sewing Club becoming a constituted group.

In addition to this direct work with the residents, students designed and proposed architecture fragments to accommodate the clubs, which – together - formed overall schemes. This prepared the third year of the project, focusing on designing a community space for the successful programmes developed by the students so far.
Academic Year 2014-15: Re-imagining the High Street in Hayes

This academic year aimed to enable the continuation and combination of the most successful programmes from last year surrounding music and making to re-imagine their contemporary meanings for the town centre and expand access beyond the residents of the Austin Estate to include a larger community, moving into the nearby High Street area and its backyards.

“The Austin Estate lies adjacent to the High Street, facing the blank walls of the loading bays and car parks, but also brick walls screening courtyards used for storage, play, access to homes and the sale of a large selection of shoes. On the other side of the High Street the yards form a network of neglected wilderness, parking, dumping grounds and workshops. These spaces are connected to the High Street through alleyways, and have the potential to create new links – to the Austin Estate, and to the schools and residential areas beyond.” (The Cass, Projects, 2015).

The brief asked students to engage with the local community and test how spaces for making or music performance could offer a new reading of the city centre with the High Street at its core. They organized “action days”, using personal skills to test potential programmes and sites for their proposals. Like in the previous year, these activities became a platform for participation, which brought people and potential clients together on the High Street through events such as a gramophone installation, a printing studio, a paper engineering workshop for children, dance (Fig. 2) and parkour. The links between this and last year’s programme went beyond the physical, e.g. student Milana Raic continued the work started by Susan Kudo, working with the women running the Austin Estate Sewing Club.

The studio addressed the more challenging aspects of Hayes’ transformation from a vibrant but economically struggling centre to a rapidly growing Cross Rail hub with prescribed aspirations: Proposals include Emily Wheeler’s bicycle workshop, re-imagining how bikes which had been prematurely purchased by the council and are currently in a storage, could be used by the community. A proposal for a canoe club for a canal inlet and adjacent industrial site is currently being negotiated with the site owner by student Eglantina Hoxa. This has the potential to become a large regeneration area in Hayes.

Students have gained experience in working with and presenting their work to a wide variety of audiences, ranging from local residents, shop owners to politicians and representatives of Hayes Town Partnership as well as exhibiting and discussing their work and what the future may hold for Hayes at the local library.
Running Projects Beyond the Academic Year: Academic Restrictions

As projects, conducted as part of this research, are taught in the undergraduate design studio, tutors must make sure that students not only engage with the real world, but that they obtain the skills set out as academic requirements. At the end of the academic year, the work produced needs to comply with module specifications and meet these learning outcomes. The research has shown that this is possible, as long as the tutors ensure that the resulting project is valuable for the community and the students’ academic achievement is assured.

Since 2000, we have worked on live projects with our students and researched best practice with the aim of optimising learning outcomes and student experience, as well as optimising project outcomes for our client satisfaction. In the past, live projects within the studio were structured to run one academic year only to ensure the continuity of the learning outcomes each year. Within a period of eight months, the studio completed projects with the same cohort of students, who started the project. Working with real clients and at the same time satisfying a wide range of learning outcomes meant that projects often felt rushed and remained at the scale of a room, e.g. Mobile Room for London and Community Stage in Kronberg. (Denicke-Polcher and Khonsari, 2014). Though projects often continued beyond the academic year in order to be completed (e.g. Community Stage in Kronberg), students rarely benefitted of continuous involvement and if they did, often outside of academia.

This limitation to one year was difficult for the project itself, as live projects are the reality of a place and have social, economic and physical significance, deadlines of live projects with real collaborators and partners are not defined by the academic calendar, specially with the open-ended nature of projects with non-paying clients.

As explained with the case study above, we have therefore set up the studio agenda to involve consecutive student cohorts during different phases of a project. This on-going live engagement with a place and precise set of communities, partners and collaborators is a working method which can contribute to community improvement by being agile as it puts students in a position to respond to the specific needs and agendas of communities over time. Throughout this process students experience that adaptability and flexibility is an essential skill for their future profession.

Benefits to Students

The projects run within the studio teach students a high degree of adaptability: Every year students learn different skills driven by the live engagement with the city and its environment. As students are testing their projects continuously against real conditions, e.g. presenting their projects to local partners and stakeholders or organising “action days”, they experience changes of the project’s environment directly. The need to adapt and respond
becomes a natural and not an academic one. Students feel a duty of care, which develops through the engagement with a real place and real people. This way of working allows students to connect to real-life issues and act up on these, which is key in order to respond to the growing challenges of our urban environment.

Feedback from students has demonstrated that the skills learned in the studio (e.g. self-initiating projects and seeking funding) have been valuable in order to find work and highly appreciated in times of low employment opportunities. On leaving the Studio they feel equipped with a skill-set to develop self-initiated projects, and are encouraged to explore and establish new ways of working. Being flexible and adapting to changing situations makes students fit for practice. This gives them the confidence in their future professional life to take opportunities and develop new and individual initiatives within the city for its citizens.

Benefits to Communities and the Profession of the Architect

The ongoing engagement with a place also empowers communities. Students gain a presence in the place and establish new networks amongst communities, all required to make comprehensive and often radical changes within the city, which include physical as well as social designs. This teaching method enables students, future architects, to become trusted partners and collaborators through continued and open-ended engagement. This is opposed to an architect who is a service provider “by appointment” and with limited time resource. If students are learning this way of working during their studies, they will be able to take this into their profession. The current developments observed in practice and how young architecture practices operate, shows that this engaged working attitude can influence and widen the architects scope of appointment and secure work, even in times of low construction.

Shortening the Architectural Education through University-based Practical Experience

The additional value offered through this method of teaching is a new structure for the architecture education, which sits between academic context, the city and practice, still it is based at the university. By attending the Live Projects Studio, the year-out experience recommended by the RIBA (which students usually take between RIBA Part 1 and Part 2) can therefore happen during the academic education. This not only provides the above benefits to students and communities, it could shorten the architectural education in the UK, while still providing a practical experience to the students’ education.

This method of teaching responds to current trends of educational reform, e.g. London School of Architecture’s ambition to “transform training in the Capital” (Evening Standard, 2015). At the ASN conference Lines Drawn (2014) students stressed the “importance of
practices playing a role in their academic and professional training" and of "live projects… seen as a positive step in engaging with the real world."

**Conclusion: Rethinking Architecture Education and Employability**

The research has shown that teaching socially engaged live projects as part of the architectural education within the design studio comes with great benefits for the project itself, for the communities attached, as well as for our students. The case study “Re-imagining Hayes” demonstrates that architects and students need to remain community collaborators over a long period of time, free from the academic calendar, in order for projects to be successful and holistic in a social and cultural sense. The unlimited engagement with a place and community allows trust to be built up, a resilient and experimental approach to projects and – if necessary – to adapt proposals to the fast changing environment of our cities. The benefits for the students go beyond the learning outcomes, which are set in the module specifications. Joining the live projects studio has a great impact on employability. It prepares students for practice and teaches the skills to self-initiate projects. Feedback has also shown that students find working on live projects with real stakeholders extremely rewarding, giving them a reason for working beyond the academic achievement - as a side effect often improving their grades - and providing them with a sense of duty of care. In addition, the paper is advocating that a year in the Live Projects Studio combines academic experience with practice. The year in the Live Projects Studio could count towards the PEDR (Professional Experience and Development Record), which is required in order to become an ARB registered architect in the UK. The tutors, who are leading the live project, could act as employment mentors, supervising the academic and professional experience and work closely with the university-based PSA (Professional Studies Advisor). This way, the architectural education can be shortened by the year-out experience, reducing the overall time of studying and making the UK based education competitive with the time of studying in most EU countries.

**References**


Dialogue 2

Resilience Within the Legacy of the Modern City
Academy Of A New Gropiusstadt: Reality Check

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ABSTRACT Walter Gropius and his office, The Architects’ Collaborative (TAC), in the early 1960s, it was predominantly financed by the federal social housing program. Since the early 1990s, the increasing retreat of the public sector in housing provision and maintenance of public spaces challenges the spatial as well as social cohesion in those developments. Being prone to a similar process renders Gropiusstadt an exemplary case study. In a series of consecutive and parallel projects, the Academy of A New Gropiusstadt (AnG) attempted to test the settlement’s current and future potential for socially and environmentally sustainable development. By means of urban interventions, the AnG aimed at redefining and fostering a common agency to accept and negotiate conflicting agenda. Partly a story of failure, partly of success, this quest of a new common ground is rooted in the specific locality of the place. In strengthening modes of co-production with the inhabitants, the AnG aims at redefining popular architecture.

The design and planning goals as well as the lived reality in modern mass housing settlements challenge the bourgeois middle-class ideals, which form the cultural background of most design professionals. Thus, in education as well as in practice, there is plenty to learn about who actually lives in mass housing settlements in the first place, which everyday routines and practices make up the good life within them, and what the spatial, economic, and ecological qualities are in reality. Such a re-evaluation seems especially relevant in the context of current discourses on climate-adapted and energy-efficient urban design. Mass housing settlements provide small, space-saving apartments, and large unsealed open surfaces. As their proprietors operate a respectable number of buildings, energetic optimization measures can be implemented efficiently. Thus, rehabilitating this late modernist heritage seems worthwhile. To do so, the gap between the residents’ everyday lives and professional designer’s inadequate knowledge about them has to be bridged, an endeavor the AnG, as an academic laboratory, wants to take on.
ABSTRACT Not so long ago, it wasn’t so difficult for white people in the US to legally exclude people of color from their communities. For example, they could count on real estate developers to embed racial covenants in the deeds of neighborhood homes, thereby forbidding “persons of Asiatic, African, or Negro blood”¹ from living in them. They could count on brokers to never introduce “inharmonious elements” into their neighborhood.² In some cases, they could count on their city to zone entire neighborhoods for specific races, thereby prohibiting people of color from moving into majority white areas (and vice versa) in the first place.³ Most importantly of all, perhaps, they could count on the federal government to “redline” black neighborhoods, and steer lenders away from the inner-city, while also incentivizing “white flight” into segregated, postwar suburban communities.⁴ Of course, when any of these (or countless other) methods of exclusion faltered, a racist white citizenry could also commit violent terrorist acts against black people with relative impunity.

Racial covenants, racial steering, racial zoning, and mortgage discrimination have been outlawed, but there is certainly no shortage of contemporary weapons of exclusion. In this keynote, I will consider the resiliency of racism by looking at some of the surprising forms that more recent, post-Fair Housing Act weapons of exclusion have taken, from “blood relative ordinances” that require tenants to be related by blood to their landlords, to municipal-wide basketball court moratoria, to the various forms of physical barriers built along city-suburb lines.

² National Association of Real Estate Brokers (NAREB) (Code of Ethics: 1922): Article 34.
³ Antero Pietila, Not in My Neighborhood (Chicago: Ivan R. Dee, 2010).
Cultivating Ethical Ecological-Economic Sensibilities:
Strengthening resilience in Monsoon Asia

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ABSTRACT The frequency and magnitude of typhoons and cyclones, flooding and landslides has risen dramatically over the last 20-30 years. In South and Southeast Asia (Monsoon Asia) this time span has coincided with unprecedented population growth and increased vulnerability to climate uncertainty. Not just here, but all over the world, there is an urgent need for resilient forms of habitation and livelihood to be strengthened. Yet urban growth and economic development in Asia shows little sign of departing from a Western model of industrial and consumption oriented development that has degraded environments and led to the climate crisis. In this lecture I argue that building resilience must be linked to reconfiguring our notions of economy and ecology in ways that help us take responsibility for being alive together as life. I illustrate how the hyper-separation of economy and ecology that has been central to modernist thinking stands in the way of valuing the vast diversity of community economic practices of mutual support and assistance by which people share scarce resources, rescue each other and possessions, and begin to rebuild shelters in the aftermath of crisis.
Session 7

Modeling for Resilience
Analysis and Prediction of the building energy consumption under climate change for Xi’an, China

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ABSTRACT Climate plays an important role for building energy consumption. Excessive emission of greenhouse is the main reason for climate warming, which will have a major impact on building energy consumption. Under the climate change, the research and development of the hourly data generation method and quantitative simulation is the basis for the future building energy simulation analysis. However, the existing studies focused on specific regions, lacking large-scale, long time series of meteorological data and hourly meteorological database which reflects the climate change. Based on the historical observation data during 30 years in Xi’an of China, the paper got the recent-term, mid-term and far-term hourly meteorological data of the typical meteorological year in Xi’an by choosing recent prediction of SRES A1B and B1 of Inter-governmental Panel on Climate Change (IPCC) and using a statistical downscaling method of compensation method—“Morphing”. Then it produced the EPW format for the building energy simulation software—EnergyPlus. This paper predicted and analyzed quantitatively the impact of future climate change on building energy consumption in Xi’an and researched the coupling relationship between them. Result showed that building energy consumption of Xi’an has a little reduce based on the climate prediction data in SRES A1B and B1 provided by the IPCC report until the end of the century, but the energy structure will take place in significant change, the heating energy consumption will reduce and the cooling energy consumption increase significantly.

KEYWORDS: Climate change; the hourly meteorological data; building energy consumption simulation; typical meteorological year; EnergyPlus.

Introduction
The climate change impact on the energy has caused the close attention world widely. The building energy consumption possessing a large proportion in total energy consumption has rising gradually. The emissions from building caused a series of problems of environment and resources (Kwok, 2010). Generally, the life-cycle of the building is as long as hundreds or even hundreds of years, therefore, the architects need to take into account not only the current design condition but also the entire operation of the building’s life-span (Hwang, 2009).
The designer usually adopt the technology of energy consumption simulation to measure the rationality of the scheme, moreover, it need the typical meteorological year (TMY) which represents a long-term climate characteristics of the local region. The TMY is formation of the typical meteorological month (TMM) comes from different certain year, which selected the meteorological parameter impact on the building energy consumption tremendously such as the dry bulb temperature, the dew point temperature, the wind speed and the horizontal total radiation, put the different weighting factor and then summary into a character (William, 1995).

The domestic and international researches on the correlation between the climate change and building energy consumption mainly focus on the energy demand under the climate change. There are two research techniques: one is the steady-state method which is based on the energy evaluation under the different emission scenarios (Cartalis, 2001; Christenson, 2006). With further research, the climate simulated technology in the field of atmospheric research has been introduced to predict building energy consumption, it has also changed the method to analyse the building energy consumption, and the forecasting method based on statistical theory has been adopted gradually (Matthias, 2006; Lam, 2010). Another one is the dynamic method which predicts the increased degree of building energy consumption month by month, year by year within decades according to different emission scenarios (Belcher, 2005; Mark, 2008). Researchers adopted this method to get the energy projections for the star building, and found that this method preserved the physical characteristics of the meteorological data (Wang, 2010).

The key problem is how to predict the building energy consumption precisely. Obviously, the degree-day method is bounded, statistical theory is roughly, and accurately simulation needs future 8760 hourly meteorological data.

**Climatic zones in China and selection of city**

China has 5 major climatic types, namely severe cold, cold, hot summer and cold winter, mild and hot summer and warm winter (China, 1993). The zoning criteria are based mainly on the average temperatures in the coldest and hottest months of the year. The number of days that daily average temperature is below 5°C or above 25°C is counted as the complementary indices for determining the zones. The paper selected Xi'an, north latitude 33° 22 ', longitude 114° 02 ', elevation 55.9 meters, which geographic location is in the central of China, with the four distinctive seasons, especially the temperature distribution during winter and summer.
Methodology

The method to generate TMY is the Finkelstein-Schafer statistics commonly (Hall, 1978), however, the World Meteorological Organization considers the record of the meteorological variables reach a length of 30-year can reflect the local climate characteristics. The TMY consist of the historical data of different parameters, and 8760 hourly meteorological data using for energy consumption simulation software such as Energyplus. Likewise, predicting the future building energy consumption needs future TMY (Zhu, 2013; Liu, 2011). Whereas, the predicted meteorological data is the monthly value, and the predicted meteorological parameters are different than the historical record. 2011, Liu Yang put forward a new method to generate the TMY which called the Principal Component Year (TPCY) (Yang, 2011), it is beneficial to select the future TMY because of only the monthly meteorological data be considered. And furthermore, previous studies have shown that this method can reflect the climate characteristics of different areas and more accurate for a vast geographic area with varied and complicated topography such as China (Li, 2015).

The weather data in the future prediction of SRES A1B and B1 of Inter-governmental Panel on Climate Change (IPCC) are divided into the three periods, 2011-2040, 2041-2070, 2071-2100. The paper got the recent-term, mid-term and far-term TMY by using the principal component analysis (PCA), and then got the future 8760 hourly meteorological year adopting the "morphing" method.

Future TMY and Hourly weather data

Future TMY

Principal component analysis is a multivariate statistical technique for analysis of the dependencies existing among a set of inter-correlated variables (Storch, 1999) which needs monthly meteorological variables. Table 1 showed the recent-term, mid-term and far-term TMY of Xi’an by using TPCY. Fig. 1 showed the monthly variation trend of the dry bulb temperature, the moisture content and the horizontal total radiation in SRES A1B and B1. Compared with the present TMY, the monthly average increases of the dry bulb temperature were -0.325°C, 1.002°C, 2.526°C in SRES A1B, and -0.527°C, 0.647°C, 1.398°C in SRES B1 for the recent-term, mid-term and far-term TMY. Besides, the monthly average increases of the moisture content were 0.000303kg/kg, 0.001288kg/kg, 0.002514kg/kg in SRES A1B and 0.000080kg/kg, 0.000821 kg/kg, 0.000942 kg/kg in SRES B1. And the monthly average increases of the horizontal total radiation were 74.112W/m², 76.312W/m², 67.894W/m² in SRES A1B and 81.250W/m², 79.319W/m², 85.147W/m² in SRES B1.
Table 1. The recent-term, mid-term and far-term TMY in Xi’an.

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<tbody>
<tr>
<td>A1B</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>mid-term</td>
<td>2064</td>
<td>2049</td>
<td>2064</td>
<td>2068</td>
<td>2065</td>
<td>2043</td>
<td>2050</td>
<td>2057</td>
<td>2046</td>
<td>2044</td>
<td>2055</td>
<td>2054</td>
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<tr>
<td>far-term</td>
<td>2087</td>
<td>2100</td>
<td>2093</td>
<td>2087</td>
<td>2093</td>
<td>2098</td>
<td>2089</td>
<td>2097</td>
<td>2085</td>
<td>2077</td>
<td>2078</td>
<td>2097</td>
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<td>B1</td>
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<td></td>
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<tr>
<td>recent-term</td>
<td>2012</td>
<td>2038</td>
<td>2029</td>
<td>2033</td>
<td>2039</td>
<td>2012</td>
<td>2035</td>
<td>2015</td>
<td>2017</td>
<td>2029</td>
<td>2024</td>
<td>2027</td>
</tr>
<tr>
<td>mid-term</td>
<td>2049</td>
<td>2056</td>
<td>2042</td>
<td>2059</td>
<td>2041</td>
<td>2044</td>
<td>2057</td>
<td>2043</td>
<td>2066</td>
<td>2046</td>
<td>2046</td>
<td>2046</td>
</tr>
<tr>
<td>far-term</td>
<td>2075</td>
<td>2090</td>
<td>2074</td>
<td>2095</td>
<td>2072</td>
<td>2079</td>
<td>2096</td>
<td>2082</td>
<td>2072</td>
<td>2072</td>
<td>2099</td>
<td>2092</td>
</tr>
</tbody>
</table>

Fig. 1. Description Dry bulb temperature, moisture content and horizontal total radiation of TMY in SRES A1B and B1.
The different climate prediction models show the conclusion that the global climate will gradually warming. Compared with the TMY selecting from the historical 30 years period, temperature has a significant rise in January, February and December in Xi'an, and the temperature fluctuates in March and April, it should pay special attention to the heating period. And the moisture content increased obviously in July, August, September, it will have a significant impact on air conditioning load. Compared with the benchmark climate, the solar radiation value increased significantly in the future TMY of Xi'an.

Hourly weather data

The algorithms used to morph the present-day observed weather files to produce future climate weather files have been described (Belcher, 2005). In this paper, it used the period 1971-2000 observed meteorological data with the method of PCA to choose TMY to define the "present climate" baseline. These data has been morphed using the weather variables of monthly-mean values from the predictions in SRES A1B and B1, an effective procedure to generate future hourly weather data has been proposed (LISA, 2009).

Generation of future EPW files

EPW format file is the standard input format for EnergyPlus weather file, which is the ASCII text format. There are a lot of domain data sources and uncertain identity are predefined in the EPW meteorological data file, data source and uncertain identity of specific format requirements have been described (Mark, 2008). In this paper, the future hourly meteorological data of the recent-term, mid-term and far-term TMY of Xi'an were transformed into the readable meteorological files for EnergyPlus.

Building energy simulation

Xi'an lies in the central geographical position in China, which the rural construction has strong local characteristics. In this paper, a residential building of small town was simulated energy consumption dynamically adopting Energyplus. The building equipment parameters were shown in Table 2 (China, 1993).

Table 2. Overview of simulated building and equipment parameters.

<table>
<thead>
<tr>
<th>Building overview</th>
<th>Location: Xi'an, residential building in village. Two stories above Ground. The total area:157.946m². Length 10.46 m. Depth 7.55 m. Floor height 3.2m. Shape coefficient 61.2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Envelope</td>
<td>Heat transfer coefficient (W/m²·C): External wall 0.65; Roof 0.50; South window 2.8; North window 2.5; Exterior doors 2.5 Window to wall ratio: South window 0.45, North window 0.3</td>
</tr>
<tr>
<td>Personnel density</td>
<td>0.038p/m²</td>
</tr>
</tbody>
</table>
Fig. 2 showed the building annual energy consumption in SRES A1B and B1. Building annual heating energy consumption decreases and cooling energy consumption increases for the recent-term, mid-term and far-term TMY. Building annual total energy of recent-term, mid-term and far-term TMY in SRES A1B and B1 are all smaller than the present TMY. The deviation of building annual total energy are -3.325%, -3.445%, -1.408% for recent-term, mid-term and far-term TMY in SRES A1B. And the deviation of building annual total energy are -4.374%, -3.895%, -2.816% for recent-term, mid-term and far-term TMY in SRES B1.

Fig.3 showed the monthly total building energy in SRES A1B and B1. Monthly total building energy consumption decrease in January, February, March, October, November and December, and increase in July, August and September. It is obviously that the building heating energy will decrease and cooling energy will increase as the climate warming. Therefore, it shows the trend that building annual total energy consumption will increase...
firstly and decrease after that, the changing extent and turning point are different in SRES A1B and B1.

**Conclusion**

The paper selected the recent-term, mid-term and far-term TMY by choosing the recent prediction of SRES A1B and B1 of IPCC, and the present TMY according to the 1971-2000 historical meteorological data considered as the benchmark climate using PCA. And “morphing” method is used to get the future three period hourly weather data of TMY, the meteorological data files have been made for building energy consumption simulation software—Energyplus. A typical residential building in Xi’an was simulated, and the simulation result of benchmark climate energy consumption is compared with the future TMY. The results showed that:

(1) Because of the future monthly meteorological data deriving from the history data, it has the limitation of the variety and accuracy. Research the TMY which selecting from the period of 30 years can reflect the climate change acting on building energy consumption significantly.

(2) Only taking into account the change of temperature in the previous research, there is no effective treatment to the indicators of the air humidity and the solar radiation, but the two parameters have close correlation with the heating and cooling energy consumption. The climate change impacting on the building energy consumption can be reflected more accurately using “morphing” method.

(3) Building energy consumption of Xi’an indicates a slight decrease trend based on the climate prediction data in SRES A1B and B1 provided by the IPCC within the end of the century, but the energy structure will change, to be precise, the heating energy consumption will reduce and the cooling energy consumption increase significantly. Building energy consumption will not change obviously in the mid-season such as April and October.
References


Notes

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The Gap between Plan and Practice:
Actual energy performance of the zero-energy refurbishment of a terraced house

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ABSTRACT Prêt-à-Loger, TU Delft's entry to the Solar Decathlon Europe 2014 (SDE2014), demonstrated the conversion of a common terraced house to energy neutrality, whilst adding value to its living quality. The house was retrofitted according to principles of smart & bioclimatic design, using local circumstances intelligently in the sustainable redesign. Basis of the Prêt-à-Loger concept is a new skin around the house: thermal insulation in the façade and roof, a greenhouse structure to the south-east, and phase change materials in the crawlspace. The project received a lot of acclaim and was awarded five prizes at SDE2014.

During SDE2014, under the circumstances of Versailles, France, the Prêt-à-Loger house proved to be energy producing, and simulations indicated that over a year’s period it would be net zero energy. In spite of these promising results, there are several ways in which a zero-energy (re)design may perform differently than predicted, also in the case of Prêt-à-Loger. Firstly, there may be a difference between design and realisation. Secondly, simulation models may not predict the actual performance correctly. Thirdly, user behaviour can be a decisive factor.

With Prêt-à-Loger, the first category could be monitored by the team itself. The fact that the house was constructed three times could however cause small construction deviations from the ideal situation. The second category is the main topic of the research project presented in this paper. Real-time measurements in the house (reconstructed at the TU Delft campus) are executed to validate simulations. Different user behaviour is applied to test differences in actual energy performance, providing useful insight for millions of homes.

The results show, for building envelope characteristics, there is no significant difference between the simulations and reality.. A higher variation in the predicted energy can be accounted to user behaviour, specifically to experienced comfort and specific user actions.

KEYWORDS: Refurbishment; building performance simulation; zero-energy design; actual performance; model calibration.

Introduction

The Solar Decathlon is an open competition between higher education student-teams from all over the world, challenging them to design, build and operate a solar-powered ‘green’ house (US Department of Energy, 2014). Ten different sub-contests are included to
ensure the design and construction (in ten days) of a well-integrated house that can be energy-efficient, attractive and affordable. In the last edition of the Solar Decathlon Europe 2014 (SDE2014) in Versailles, France, a multi-disciplinary team from TU Delft called Prêt-à-Loger (translated as “ready-to-inhabit”) participated with a proposal focused on the existing housing stock rather than on a new house type. The starting-point for the team were post-war terraced houses (called row-houses) and the challenge to make them energy efficient while creating new quality space. The row-house typology is very common in the Netherlands, representing around 60% of residents' homes in the country (Eurostat, 2011).

In order to address this, as a case study a reference row-house was chosen from Honselersdijk, a small town south of The Hague. All features of the reference house were used for the SDE Prêt-à-Loger redesign, including its properties and relatively unfavourable south-eastern orientation. Based on the house’s challenges, the team designed an external intervention system called “The Skin”. The Skin combines heat loss reduction on the north-west elevation by applying PassivHaus standard external insulation and a light glasshouse structure to the south-east façade. This glasshouse is in fact an integrated system, combining energy production through PV panels on its roof and façade, reduction of heating requirement by forming a thermal buffer and the creation of an extra high-quality space, by forming a direct connection between exterior and interior. The Skin system was prototyped on a real-size replica of the prototype and participated in the competition, was awarded various prizes and took the third place overall, only 3 of the 1000 points behind the winner. After deconstruction, the house was transported to the campus premises of TU Delft, standing currently as a demonstration, education and research facility for the university. More details on the design process behind the system can be found in another AR2015 paper released in parallel (Dobbelsteen et al., submitted).

**Problem statement - Methodology**

In spite of promising design intentions and simulation results, there are several ways in which a zero-energy (re)design may perform differently than predicted, also in the case of Prêt-à-Loger. Firstly, there may be a difference between design and realisation: actual insulation thicknesses may be thinner; different building products may be used; onsite interventions – sometimes necessary – may change the original design. And for Prêt-a-Loger the fact that the demountable house was constructed three times may have led to construction imperfections, such as chinks and cracks. Secondly, simulation models may not predict the actual performance correctly, due to imperfections in the software or inaccurate input. Thirdly, user behaviour can be a decisive factor. Ecological awareness, active control, intensity of usage, individual preferences all play a role in the eventual energy performance. Since the Prêt-à-Loger house closely represents a newly refurbished post-war dwelling,
featuring an extensive monitoring infrastructure, it can be suggested as a possible candidate to study the above effects.

Theoretically, the question can be quite simple: how close are the design assumptions and simulations to reality, at least as represented by the measurements of the monitoring system. Nonetheless, the real answer is complex. The performance of a building is affected by a multitude of interconnected parameters; the significance of them varies per building case, location, conditions, use profile etc. The large number of parameters create, as expected, a significant challenge in simulating the building’s performance (Coakley et al., 2014). Even by using various assumptions and controlled use profile to limit the parameter list, still some of them are difficult to determine accurately; notably the U values of the walls, and the rates of natural ventilation and infiltration. These are also mentioned in the study by Majcen et al. (2013) as highly influential parameters for the typical Dutch dwellings. They are associated with heat losses through the building envelope, a key factor in estimating the energy needs of the house.

Taking the above into account, a strategy was devised to try to study the reality and model convergence for the Prêt-à-Loger house. It is based on separating the influential parameters in the analysis, in order to minimise the coupling of their inaccuracies. Firstly, the envelope heat loss parameters are validated against measured data, appropriately filtered to avoid local disturbances in the interior. That can illustrate the real effectiveness of the building envelope to retain the heat and verify the design of the component U values and infiltration rate. Then, by using this validated model as basis, the user behaviour and installation performance can be studied and provide a more realistic estimation of the energy use.

The simulation, measured data filtering and comparison are performed by a custom automated process, allowing large amounts of data to be analysed and compared in a short amount of time.

Carbon neutrality target

The Prêt-à-Loger proposal for Solar Decathlon 2014 included a detailed sustainability analysis (Prêt-à-Loger, 2014), for which it was awarded the first prize on this specific sub-contest. The analysis included strategies on energy and carbon neutrality for the house and urban scale. 116,350 kg of CO₂ equivalent emissions were calculated with the “IPCC GWP 100a” method, for a lifetime of 50 years after the Skin application. The greatest share was made up from the transportation of the users (82%), mainly with personal cars. Therefore, the strategies focused on reducing this share by promoting the use of electric vehicles (and especially electric bikes) from the excess energy produced by the PV panels. From
simulations, the energy consumption for the house was estimated to 3200 kWh annually, allowing for 500 kWh of energy for transportation, which can limit CO₂ emissions significantly. Nevertheless, this again depends on the difference between simulated and actual energy consumption of the house, underlining its significance even further.

**Climate and monitoring system description**

The design of the climate and installation system is based in making the existing house effectively adaptive for the different seasons in a year. As expected for a north-western European country, the focus of the system is on anticipating the low winter temperatures and minimising the heating requirements. The main solution introduced for this is the glasshouse on the south-east side, functioning as a thermal buffer, effectively reducing the energy demand by 34% (from design phase simulations). Combined with double-E glazing windows, thick thermal envelope insulation and improved airtightness, it results in a total energy reduction of 79%. A solar thermal system is used, in which thermodynamic panels extract the heat from the glasshouse and transport it towards a heat pump. This heats a 300 litre water tank to 55°C, which can then warm the 6 radiators of the house and provide hot tap water. The mechanical ventilation system is supported by using pre-heated air from the glasshouse when appropriate and a Heat Recovery Unit of 96% efficiency. The balanced ventilation is CO₂ driven and controlled by the home automation system.

![Fig. 1. Section of the Prêt-à-Loger house, explaining the climate system in spring/autumn.](image)

In the mild and wet seasons of autumn and spring, the glasshouse can harvest the heat from the increased sunshine, allowing for the passive heating of the house, by opening the intermediate doors and windows (Fig. 1). Temperature monitoring in all spaces, as well as CO₂ and VOC measurements, constitute the driver of the home automation system, in order to optimise the interior climate. For example, it can ventilate on high CO₂ levels or open the
glasshouse windows on overheating. It can also report and advise the user, who is allowed
to manually override the system per comfort preference.

In summer the system’s function is to retain comfortable temperatures in the house while
producing the bulk of energy to render it zero-energy on yearly basis. The 4.9 kWp total
power, is estimated to produce over 3.700 kWh yearly. Finally for avoiding overheating, the
ventilation system attracts fresh air via phase-changing materials (PCMs) in the crawl space,
in order to pre-cool the air.

**Comparison on building envelope characteristics**

The data collected by the monitoring system from October till March are filtered to avoid
periods of occupation or energy use for heating. Specifically for the first, the reasoning is
that as the house is used as an exhibition space, the user behaviour cannot be taken as
uniform as in residential use, even if the monitoring system can detect user presence. Also,
periods of malfunctioning sensors in the main rooms of the house are also excluded. This
filtering results in 15 testing periods, each of which had at least 12 hours of continuous
measuring.

These periods are then simulated with the EnergyPlus software (Energyplus, 2013) and
relevant weather conditions per period, derived from hourly measured data from KNMI, the
royal meteorological institute of Netherlands. The filtering allows the use of a “free-running”
simulation to study only the reaction of the house to the fluctuation of external temperatures.
It is noted that the model is “pre-conditioned” through a custom developed process in
EnergyPlus, in order to reach the initial conditions of each measured period. In total, the
model forms an accurate representation of the actual geometry of the house, where each
room is simulated as a separate zone; while its material properties are assumed from the
design and the weather data from the wider Delft area as monitored by KNMI. On the other
hand, the whole building simulation approach of EnergyPlus, including heat balance-based
zones and multi-zone air-flows, allows for a physical modelling of heat flows that is deemed
sufficient for this typology.
The plot shown in Fig. 2 refers to the living room, which represents more than 50% of the total house volume. From a visual observation it can be derived that the convergence achieved is significant, as for a representative period in January, the simulation temperature profile fits closely the one from measured data, with 2.5% of error. The error is around 2-7% below the measured data in the other zones and the rest of examined periods. This suggests that the design assumptions used were possibly over-conservative, or that there are more parameters favourable for the real building, which were not taken into account. If the house is modelled as single-zone, the error stays at the same level, but its position varies per period, found below and mostly above the measured curve. Opposite from before that may mean that the building properties are slightly worse than designed. This can be explained due to the multiple assembly (first as a test house, then at the competition in Versailles, finally at the TU Delft campus), creating cracks and slits lowering the efficiency of the building envelope.

Although convergence criteria exist for energy calibrations, e.g. from ASHRAE (ASHRAE, 2002), for the temperature case no apparent indication can be found in literature. Nevertheless, it can be suggested that since the temperature root mean square error is less than 1°C in most of the cases, there is no appreciable difference for the user or for the HVAC control system. Therefore it can be assumed that the physical behaviour of the house is simulated to a satisfying level.
Comparison with a user week

To further explore the actual behaviour of the house, an experimentation week was performed from 6th to 12th of April 2015 (spring, heating season for Delft). In this period, the premises were not used as an exhibition space but solely as housing for one person. The behaviour was kept as close to reality as possible, following a daily protocol that resembled the intended housing occupation with a regular activity pattern such as sleeping, office working, cooking and eating. These included normal appliance use and configuration of the climate system to address the comfort experience e.g. use heating when felt cold or turn on ventilation in cases of low air quality. Different residential user behaviour patterns were tested and the actions involved were logged and subsequently used to explain the data from the monitoring system. Two days with the most influential behaviour for energy are presented in Fig 3.

In the first graph, the exterior conditions include mostly cloudy weather, light precipitation and temperatures of around 5 to 12°C. It can be observed that the temperature in the glasshouse reached almost 17°C, minimising the losses from the south-east side. However, it has to be noted that although the air temperature in the living room-kitchen was between 19 and 21°C, the comfort level experienced was not ideal, leading to an almost constant use of heating. It is suspected that the difference between air and operative temperature is the culprit, as the small thermal mass of the wall possibly leads to low radiant temperature. The small mass results from the timber frame construction of the house, used in order to facilitate transportation and fast assembly during the competition. The real house has lime stone blocks and brick masonry, creating greater mass. Another possible reason was the experienced draft, which is presumed to be created from the direct staircase connection of the living room with the first floor. The hot water requirement from the radiators led to a constantly operating heat pump (nominal power around 0.6-1.5 kW) and subsequently to the largest energy use of the house.
In contrast, the second day was sunny with a maximum exterior temperature of 17°C. The temperature in the glasshouse reached almost 30 degrees, enabling passive heating of the house, by opening the interior glasshouse doors and the bedroom windows. The overheating was controlled by adjusting the operable windows on top and bottom, bringing in fresh air and creating thus a pleasant working environment in the glasshouse between 12:00-17:00 h. Active heating or ventilation was not used and the compressor of the heat pump was in less frequent operation and with higher efficiency to keep the water at 55°C. Due to the high solar irradiance, a power production of 20.71 kWh surpassed the total consumption of 11.8 kWh, however without covering all the peaks, which are attributed to the specific use schedule. For reference with the above, the energy consumption from the simulations for similar residential use resulted to around 10 kWh on an average day.

Finally, it has to be noted, that the power diagrams offer insight on the energy consumption characteristics of the house, especially on the use of appliances. Nevertheless, the problem remains to estimate the significant and continuous consumption of the heat pump, in relation with the space heating requirements and the external temperature fluctuation. For this, further research will be conducted using the specific case-study.

**Conclusion, discussion and recommendations**

The results of the study discussed above can offer some possible indications about what might affect the real behaviour of the dwelling. It appears that for the building envelope characteristics, there is no significant difference between the model and reality for the available data. The project’s high-quality control, where it was assured that panel components were constructed as designed in the factory, might pose a possible explanation for it. Nevertheless, efficiency could still have been reduced by assembly errors, resulting in
thermal bridges between elements. Although this is the expected scenario, it is only validated if the house is simulated as single-zone, suggesting that the modelling technique is also a significant factor and should be researched further.

A higher variation in the energy predicted can be seemingly accounted to the user behaviour, specifically to experienced comfort and user actions or schedule. For the first, experienced comfort, it can be assumed that the difference in comfort conditions might stem from the lower quality control of the assembly and finishing of the building, in contrast to the panel manufacturing. Also, the design target of optimal comfort conditions can often become secondary in front of architectural, construction or even policy issues, as shown here with the open staircase and the low thermal mass. For the second, user actions or schedule, it can been suggested that the knowledge and use of passive strategies, such as ventilating from the pre-heated glasshouse, can help reduce the energy use, along with support from active control and advice from the monitoring system.

Finally, a future continuation of research in the prototype house can include detailed user comfort in zero-energy designs. Another subject can be the effect of HVAC configuration and home automation systems, deemed here as influential to energy consumption.

References
Environmental Simulation for Designing with Climate Change: Framework, Experiment and Reflection

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ABSTRACT The paper presents a framework of environmental simulation for site-specific climate change adaptation design at urban neighbourhood and building scales. The simulation framework consists of four elements: (a) urban microclimate modelling, (b) generation of site-specific climate change adapted weather data, (c) outdoor-indoor coupled environmental simulation for building energy analyses, and (d) evaluation of site-specific climate change adaptation design features. An experimental workflow is formed through linking together a number of existing software tools and datasets. Although computationally expensive, the workflow can generate visual and numerical results showing how an existent or proposed building in its immediate neighbourhood context may perform under its microclimatic conditions of present-day and future years. The simulation framework and workflow was applied to postgraduate research and design programmes as a step toward climate action. Given that site-specific climate change adaptation design now a possibility, we reflect on a number of pedagogical propositions as informed by our current experiment.

KEYWORDS: Climate change; site-specific climate change adaptation design; urban microclimate; environmental simulation; urban neighbourhood and buildings, digital design pedagogy.

Introduction

According to the latest assessment reports (AR5) published by the United Nation Intergovernmental Panel on Climate Change (IPCC), with 95% certainty humans are the dominant cause of global warming since the 1950s. The IPCC AR5 states that the global surface temperature increase by the end of the 21st century is likely to exceed 1.5°C relative to the 1850-1900 period, and is likely to exceed 2.0°C for many CO2 emission scenarios (IPCC, 2013-14). Prior to the publication of the AR5, on 10 May 2013, the CO2 levels in the atmosphere were reported to have broken through 400ppm, which has not been seen since three to five million years ago on a regular basis (Shukman, 2013). Advising the UK Parliament and Government, the Committee on Climate Change has warned recently that premature deaths from overheating could triple to 7,000 per year by the 2050s if new homes and public buildings continue being designed and constructed without regard to the impact of rising temperatures on an aging population (CCC, 2014).
Despite the above and many other scientific assessments on climate change now widely available in the public domain, climate change inaction remains entrenched in many parts of the world. There are many complex reasons why such inaction persists. One of them might be that architectural practitioners simply lack the knowledge, tools and skills to design in response to the specific impacts of climate change known to their project sites. The realisation of projects contributing to sustainable climate change adaptation depends on acquiring the capacity for synthesizing different kinds of practical knowledge – knowing what to do and how to do it. The current on-going trend of climate inaction could be tackled if local communities are shown clearly the benefits of well-designed adaptive neighbourhoods and buildings as a measure to build up local resilience to impacts of climate change.

Addressing the key criteria of site-specificity, we have been researching an experimental framework of environmental simulation for climate change adaptation design. The applicability of the framework was applied and tested in our postgraduate research and design programmes as an initial step towards climate action. The premise is that site-specific microclimate of an urban neighbourhood sets up the preconditions of how individual buildings within the neighbourhood may perform environmentally, which in turn affects inhabitants’ energy consumption in indoor environmental conditioning. Local resilience to climate change risks can be significantly enhanced if more architects are able to design with future urban microclimate in mind. In the next section, the overall framework of environmental simulation is presented including its concepts, software tools and dataflow. We then show results of applying the framework and workflow in our postgraduate research design activities. The final section presents a critical reflection on the pedagogical propositions as informed by our current experiment.

Environmental Simulation for Site-Specific Climate Change Adaptation Design

Within the field of architectural science, the development of computer modelling and simulation of the built environment has become a distinct research area since the 1980s. Software packages of environmental simulation for acoustics, lighting, building energy are now widely available. However, we find no such off-the-shelf software packages capable of environmental simulation for designing with climate change in a site-specific manner. What we have at the moment is disparate software tools and datasets that might be linked up to form an experimental framework for site-specific climate change adaptation design.

The Framework

Our framework of environmental simulation for site-specific climate change adaptation design on urban neighbourhood and building scales comprises the four key elements:
Urban microclimate modelling for generating site-specific weather data as inputs to whole building energy simulation;

Downscaling of general climate change projection of macro-mesoscale to urban neighbourhood and building of a micro-nanoscale;

Incorporating climate change projection of a mesoscale into urban neighbourhood microclimate modelling to generate site-specific climate change adapted weather data of future years; and

Uses of the site-specific climate change adapted weather data in assessing environmental performance of proposed neighbourhood and building design features for present-day and future years.

Software Tools and Weather Data

In our search for software tools for urban microclimate modelling and simulation, we have used ENVI-met. Developed by Bruse and his team at the University of Mainz, ENVI-met simulates air-surface-plant-soil interactions in the atmosphere affecting the microclimate based on fluid dynamics and thermodynamics (Bruse & Fleer, 1998; Bruse & ENVI-met Team, 2015). The validity and reliability of ENVI-met has been tested in its numerical calculations and 3D finite difference computation to simulate the main outdoor built environment interactions (Ozkeresteci et al. 2003). An earlier attempt at computer modelling of urban microclimate by Erell and Williamson (2006) produced the CAT (Canyon Air Temperature) model, which was applied to compare the effect of air temperature on building energy performance located in Adelaide, Glasgow and Sde Boqer. However, unlike ENVI-met, CAT does not compute relative humidity.

For generating climate change adapted weather data at a city level, we use the CCWeatherGen tool developed at the University of Southampton (SERG, 2009). Central to the design of CCWeatherGen is the ‘morphing’ methodology for climate change transformation of TRY/DSY weather files (Belcher et. al., 2005). By selecting one of the four greenhouse gas emission scenarios (i.e. Low, Medium-Low, Medium-High, and High Emissions), users can generate weather data files projected for the timeframe of 2020, 2050, 2080. Based on a similar methodology, CCWorldWeatherGen was developed as a separate tool to be used by climatic regions outside the UK (SERG, 2012).

The Dataflow

By linking the software toolkits identified above together, we constructed a dataflow as an implementation of the environmental simulation framework (Fig. 1). For simulation of...
present-day microclimate of an urban neighbourhood site, we start by modelling the site using ENVI-met’s input area and configuration editors. The simulation outputs are then viewed in LEONARDO, a data visualisation module within ENVI-met. Users can view a wide range of simulated microclimate outputs in images such as potential air temperature, relative humidity, wind speed, wind direction, etc. The “Receptor” construct in ENVI-met can be used to produce location-specific microclimate outputs within the input area. We introduce the ENVI-met receptors to students as ‘virtual weather stations’ that can be placed anywhere inside the input area model to collect location-specific simulated climatic data. If placing a set of receptors around a building, one can generate location-specific weather data files as inputs to whole building simulation.

For simulation of future years (2020, 2050, 2080), CCWorldWeatherGen is used to provide the initial projected climatic conditions as inputs to ENVI-met simulation. This crucial step will generate climate change adapted site-specific weather data as inputs to whole building simulation. In short, this simulation dataflow is designed to evaluate how an existing or proposed built environment (indoor or outdoor) may perform in its immediate urban context under climate change adapted microclimatic conditions. Although there are several gaps in the current dataflow which require tedious manual data editing, the objective of site-specific climate change adaptation design can be broadly achieved via an iterative application of the workflow from present day to future years.

Applications of the Framework in a Postgraduate Design Research Setting

The environmental simulation framework and workflow as described above has been applied to our postgraduate research and design programmes. At a doctoral level, the first application was a case study of a new residential neighbourhood development proposed for New Cairo, Egypt. The weather data collected at the Cairo Airport (about 30km west of the case study site), was applied to generate weather data of future. The study focused on a comparison of neighbourhood outdoor and building indoor simulations of the hottest day of
present and future years (Fig. 2). In the present-day analyses, the ENVI-met and Ecotect coupled simulations showed that there is +0.29°C on the ground floor and +0.57°C on the first floor of the building unit when uses of the ENVI-met adapted weather data and the remote Cairo Airport weather data are compared.

![Fig. 2. ENVI-met and Ecotect coupled simulation of a proposed urban neighbourhood development for New Cairo: (a) an example of EVI-met PMV visual output, (b) an example of Relative Humidity visual output, (c) Ecotect simulation of a building unit ground floor design, (d) Ecotect simulation of a building unit first floor design.](image)

The second application of the framework to a doctoral thesis project investigates climate change adaptation design in the urban context of Seoul, South Korea. The geo-location of the project offers an opportunity to investigate the impact of climate change on high-rise residential neighbourhoods and apartment buildings as widely inhabited across the city districts of Seoul. As such a site-specific adaptation design strategy may be formulated in response to the microclimate model overtime. In particular, analyses of the energy consumption data made available publicly by the Apartment Management Information System may reveal correlations with particular urban microclimatic factors of the city districts. Such correlations, if found, will point to certain aspects of the urban microclimate model to be focused on when carrying out simulation studies of future years. Thus, the environmental simulation outcome will provide a basis for developing site-specific climate change adaptation design strategies and features for the existent or proposed high-rise residential neighbourhoods and apartment buildings in the city districts of Seoul.
The basic concepts and dataflow of the simulation framework have also been introduced to groups of postgraduate taught masters’ students who undertook courses on urban visualisation modelling and digital design of interactive built environments. The learning process involved three sessions of intensive workshops for the students to learn the software and dataflow well enough to undertake site-specific case studies. The university campus environment where the students studied was found to be pedagogically pertinent in setting out the modelling tasks and interpreting simulation results. Small groups working on multiple neighbourhood sites offer the opportunities to compare the simulation outputs in relation to the different micro spatial and environmental topologies presented by the campus environment. For instance, outdoor and indoor spaces in a quadrangle site with certain courtyard aspect ratios appear relatively resilient to the microclimatic changes simulated within the timeframe (Fig. 3).

Fig. 3. A quadrangle site on campus appears relatively resilient to microclimatic changes overtime: (a) the site modelling, (b) an Ecotect analysis of the courtyard building based on ENVI-met adapted microclimate 2012, (c) an Ecotect analysis based on microclimate 2050 showing an increase of 1.0 ºC on average from 2012.

In a digital design studio setting, some students experimented with taking particular ENVI-met simulation outputs, such as PMV (Predicted Mean Vote) values indicating human thermal comfort levels, as inputs to their form finding exercises employing parametric modelling techniques (Fig. 4). The students were interested in finding out how the environmental performance of their project sites may be improved through proposed interventions in response to the climate change simulation outcome. Due to the current limit of ENVI-met, the simulation-design iterative process cannot be truly realised at present.
Fig. 4. A postgraduate digital design studio project showing a workflow from site-specific ENVI-met PMV output as input to form finding in parametrical modelling.

**Beyond Environmental Simulation: A Pedagogical Reflection**

As shown above, designing with climate change is defined as a process of site-specific iterative design modelling informed by environmental simulation. The simulation itself does not generate design solutions but provides computational assessments of how a proposed urban neighbourhood-building design may perform under the climate change scenarios as specified by the designers. We have identified and used several publicly available software tools to implement the dataflow. Based on our experience of applying the framework to postgraduate research and design programmes, we reflect on a number of pedagogical propositions as informed by our current experiment.

**Prerequisites of environmental simulation and designing with climate change**

Our attempt at applying the simulation framework and workflow in a pedagogical setting has shown the need of preliminary background knowledge without which the learning can be reduced or even lost in merely operating software tools and data editing. The prerequisites include (a) urban microclimate modelling, (b) climate change projection scaling/morphing, (c) outdoor-indoor coupled whole building energy simulation, (d) vegetation, and (e) passive design features for mitigating climate change impacts such as those presented in *Design for Climate Change* (Gething & Puckett, 2013). This body of knowledge will prepare learners to appreciate the capabilities as well as limitations of the software tools employed.
ENVI-met urban microclimate simulation is computationally expensive

Although ENVI-met can be run on a PC, it is computationally expensive. Because of its heavy demand on PC computing power, it is only practical to restrict the duration of a single simulation to be within a period of 24 hours for getting hourly outputs. Hence, our ENVI-met simulations were run for particular days of a year (e.g. the hottest or coldest day), which is a long way off what is required in standard whole building simulation. Although design students can learn to prepare for inputs and to visualise the outputs with relative ease, the ‘long wait’ for simulation to finish also means that interactive design with ENVI-met is not possible. Without new capabilities of computation and interaction, it is unlikely for site-specific climate change adaptation design practice to emerge more widely.

Uncertainties in computer models

All the software tools used in the simulation framework display results in specific numeric and visual formats. Seeing these numbers and images, one can be easily led to overlook uncertainties inherent in these computer models. None of the software tools have been designed to communicate explicitly the uncertainties in the computer models that users should take into account when interpreting the simulation outputs. This is particularly problematic for software users as they bear direct responsibilities for conveying the environmental simulation results to their clients and users. There is a real need to better understand how software users’ confidence and trust is related to information about uncertainties in the computational models.

Stepping into stakeholder and community engagement

Realisation of site-specific climate change adaptation design as presented above will be as much of social engagement as of computational simulation. Getting environmental simulation results, design teams still need to explain their design decisions to stakeholders and the wider community. In his pioneering work on community engagement with climate change, Sheppard has demonstrated how multi-dimensional digital visualisation can be effective (Sheppard, 2012). Non-technical audiences tend to grasp better the vital issues at stake when engaging with visual information. In this regard, visualisation of environmental simulation outputs can be deployed in events of social engagement. Nonetheless, as shown in our applications, effective communication of urban microclimate simulation of site-specific adaptation design is a nontrivial task. The quantity and variety of simulation outputs require careful selections and interpretations of the visualisation. This calls for further research into a new visual language for communicating complex dynamic environmental datascapes.
Beyond computational simulation for designing with climate change

To recap, site-specific climate change adaptation design is defined as an iterative design process in which 3D form and materials for building construction and landscaping of an urban neighbourhood are specified and evaluated, taking into account the likely environmental effects of climate change. Computational environmental modelling and simulation is considered to provide a key capability of designing with climate change - a global phenomenon which is partially understood, and the understanding is constantly subject to reassessment as new data/evidence/model emerges. Our goal is to achieve climate change adapted design specific to an urban neighbourhood context that could contribute to building local resilience in a bottom-up manner. Having applied such design modelling framework to various geolocations, we realise that there remain links to be made in other areas, especially in economics and governance of urban transformation. Such cross-cutting linkages will doubtlessly cast new challenges to the next generation modelling and simulation platform expected of better and richer facilities for expanding repertoires of design for climate change as well as increased capacities for engaging local communities with climate change actions.
References


Session 8

Community Resilience, Planning and Place
ABSTRACT Nowadays, the phenomenon of social exclusion is growing up, especially in the middle-great cities. Private affairs are acquiring a greater and greater control over the choices and the projects connected to urban transformations and, at the same time, they are ignoring the collective needs. The binomial private-collective affairs risks to weaken the resiliency of the cities, in other words it risks to weaken the ability of the urban system to react to the changes in a positive way. Since the urban system is complex, the preponderance of the profit-oriented logic weakens those components that should aim to reconstruct a new and effective balance. As known, the urban plan (UP) depends on the normative choices and on the political-administrative decisions. According to this, the UP – that does not have empowerment – is not a tool that can engrave on the resiliency of the city by itself, by increasing the capacity of structuring fair and sympathetic urban systems. Since the UP is merely a tool of technical support to the political project, it is clear that the role that it can play for the realization of a resilient city strictly depends on the policy choices (about integration or expulsion, assimilation or exclusion, hybridization, solidarity, marginalization, and citizenship, etc.). In reference to the Italian context, the paper investigates if and how the UP can provide effective responses to the needs of the most vulnerable citizens and, in particular, of the immigrants’ urban life. The UP defines, in fact, the articulation of the "adapted space", which must set the conditions through which each need can be expressed and satisfied, through which a suitable offer corresponds to the social demand, not only in quantitative terms but also in symbolic, aesthetic, semantic and identity terms. Therefore, the paper explores how public spaces can be structured and organized so that even "other" cultures can identify and acquire new shared identities and how different interests that often conflict between them (as, for example, between market and welfare) can be mediated. In the end, the paper tries to figure out whether and how the UP can make a contribution to the solution of conflicts between the above contrasting interests. The last research question deals with the tools that can support the act of planning or of developing (decision support – participatory processes) since they can let us understand if they can be effectively implemented, ensuring the contribution of the weaker members and the fulfilment of their needs.

KEYWORDS: Resilience, interethnic city, urban plan.

Introduction
The resilient city can be meant as the ability of positively absorbing the forces that drive changes, that is the ability of urban systems (which by definition are meant as complex) (Von Bertalanffy L., 1968) to modify in an harmonic way all its components (city of stone, city
of relationships, city of perception) (Beguinot C., Cardarelli U., 1992), including the weakest social parties and the less managed physical parts. The most obvious changes in the world are found in the global climate changes, the alarming decrease of finite resources, the widespread pollution, the increase of megacities and their insecurity alongside, in the "developed" countries, with the worrying reduction of social service policies and the resulting restrictions on immigration from abroad. In order to tend toward resilient urban environments, it is necessary to sharpen the tools of planning, management and administration of the cities. If the main instrument of urban organization is the Urban Plan (UP), it is with this one that the right answers to the stress of changes should be provided. It has to be highlighted that the urban planning, particularly in Italy, is a technical activity subject to the Laws of the State and of Regions and to the political and administrative decisions of individual local realities. In this paper it will be illustrated the state of the art of urban planning in Italy and if and how it could contribute to building a resilient city and, in particular, whether and how with the current practices, solutions that take account of the multiethnic and multicultural coexistence are being thought and implemented.

Urban planning in Italy

In Italy, the institutional definitions of urban planning can be dated back to the Seventies. According to Judgment of the Civil Code 239, December 20 1972, "The urban planning includes everything related to the use of territory for the location, typing the settlements of any kind with the relative infrastructures" and the urban planning is "the discipline of the territory’s use including all cognitive, regulatory and management aspects regarding the operations of safeguarding and development of land and the protection of the environment" (Art. 80, DPR 616/77). The laws for the “territory’s administration” are issued by the State and the Regions and the responsibilities of the specific plans are assigned to public institutions that administer and manage the several areas of territorial interest. After the enactment of the Planning Law in 1942 and, especially, after the fall of the fascist regime, the debate on the relationship that existed between urban planning and power juiced up. Over the Sixties and Seventies, this debate was enriched by authoritative international contributions: basically, the technical planner was rebuked of being uncritically subservient to the will of power and too shyly committed in finding effective responses to social issues.¹ Urban planning is a technical activity and, like any other techniques, it represents the specialized knowledge of making in order to pursue a predetermined outcome, of course superior laws defines the field of action. The choices concerning urban transformations, the projects and the ability of pursuing them are political dimensions. The role entrusted to the UP, and then to the technician who draws it, is primarily to translate the political instances
into liveable spaces. However, also the task of transparency – that is to make explicit and understandable the pros and cons of all the possible alternatives of urban planning able to achieve the predetermined result – competes to the technician who elaborates a plan that pursues the political goal. In Italy, a UP must be first "adopted" and then "approved". The adoption is a political act according to which what has been provided together with the technical solutions and prepared is then ratified. The approval is an administrative act that confirms if the policy choices and the technical solutions are in compliance with the current regulatory system. The reflection must therefore be focused on the path through which power take the choices about the urban future, wondering how, when and how much the UP (along with countless other subjects and tools) can legitimately contribute and/or affect the choices that decision makers take. A little more than a decade has passed since in Italy were introduced rules in relation to participatory structures trying to move the forming process of the UP toward a bottom-up direction when implementing the EU directives and establishing the practices of other Countries.

The public and private city

Cities are made up of spaces for public and private uses, of public and private properties. The UP system rules the overall use of the territory and also the relationship between public and private city. The economic and financial interests of private companies have grown more and more and, by consequence, also the influence that they exert (on the processes that guide decision, implementation and management of the "public city" and the single public works that make it up) increased. In recent decades, on the one hand the power of the private entity has grown up, on the other hand the public investments have diminished. As a consequence, the welfare state has been weakened and, as already mentioned, the economic globalization of multinationals has affected urban globalization, including historical centres too. The UP planning is not an ideal project exclusively based on theoretical models. According to policy choices, the UP must localize public and private spaces and calculate the surfaces of services and of facilities that need to be realized; the UP rules the use of the different areas of municipalities, by adjusting intensity and form of both public and private ones. The UP defines procedural and parametric rules in order to allow the implementation of those interventions chosen by public decision-makers, and to mediate between the multiple interests represented by different social actors. As public institutions have increasingly reduced their investments and so their decisional capacity has been reduced. Italian laws, starting with L. N. 142 of 1990, sanctioned the change that, beginning from simplification and transparency of procedures objectives, has
appointed an always major role to private economic subjects, making the UP an increasingly vacuous tool of orientation (bargained and negotiated with the granting of exemptions) (De Lucia V, 2001) and less and less a reference point of certain rules at the service of the community’s welfare. If the UP is a mere instrument of technical support to the political project, it is clear that the role it can play in the creation of a multicultural and resilient city is highly dependent on the policies (of integration or expulsion, assimilation and exclusion, hybridization, solidarity, marginalization, citizenship, etc.) that each Country decides to adopt, even in the context of EU directives. A policy of equity and solidarity, focused on the community interests, including the environment, is a policy that can give birth to interethnic cities. On the contrary, when public institutions uncritically yield to the “market” pressures, by allowing that only economic aims defines social relationships (Polanyi, K., 1974), then it is very difficult to shape a resilient city that takes into account the social issues not generating profit. It is precisely in the presence of weak social policies that scholars are called to exercise a critical and creative reflection on the desired future to build. Among the actors involved in the transformation process, urban planners are responsible for production of viable scenarios of plural city, able to ensure the efficiency and accessibility of urban opportunities, while respecting the principle of sustainable development. The "adapted space" should create the conditions in which each need can be expressed and satisfied, where to the social demand corresponds a suitable offer, and not only in quantitative terms but also in symbolic, aesthetic, semantic and identity ones; urban spaces have to respond to the demands of different cultural genesis and that new culture which, as always has been, will be formed through the meeting and linking of the original diversities.

Participation in the UP

Participatory processes, directing both political and administrative decision-makers towards choices of general and real interest for the community, contribute in bringing back the city toward an institutional dimension of service to all citizens as supposed to be. In addition, the support provided by the citizens (who, in a direct or mediated way, show their needs) drives the decision maker toward a more favourable condition in which it is possible to mitigate the power of financial and estate forces that, despite their relevance, are among the so many interested and involved subjects. Even if, in recent years, national and regional laws have established that UP has to be developed with the participation of citizens (except for some isolated experience), the procedure by which it is possible to comply the law provision is limited to mere formal aspects. In Italy, and in particular in Southern Regions, a real culture of transparency and participation is still far from real. This is in opposition with US culture that, starting from the Sixties, gave voice and role to weakest social categories.
with the advocacy planning (Davidoff, P., 1965). Throughout the course of several experiences over the years (starting with those of East Harlem (Katan R., 1979) and Cleveland (Krumholz N., 1982) various methods have been devised. All of them aim to give to technical planners the role of promoter and supporter of the interests of those citizens who, while suffering more than others the urban hardship, lack the means and the power to direct the UP toward a suitable direction. John Friedmann, one of the major scholars of "social planning theories", criticized the up-down process and the incomprehensibility of technical language and, through many published studies, explained how to develop collaborative settlement and participatory plans. His theories are getting more and more radical positions. The evolution of participatory processes is based on many other contributions of planners and scholars, who refine concepts and practices, focusing on issues related to communication (Habermas J., 1981) between technicians, institutions and citizens (Foster J., 1989). Besides putting the people in a condition of "understanding" the tough language of politicians and planners, the main purpose is that people, based on the experience of everyday life and with the necessary "technical assistance", could be able to formulate suggestions for intervention that should find space and consensus within the decision procedure (Foster J., 1999). Even the European Union has published a report about participation in the UP, developed with the "participation" of members of the "Urbact Partecipando" network, who exchanged experiences implemented in range of intervention programs put into effect in their respective cities. Assuming that there are different models and theories of democracy, different types of participation and heterogeneous practices, the manual provides an overview of the possible methods of involvement, of the different players, of the institutional frameworks, etc., tending to formalize the steps and the ways of participation in the construction of a project and in its implementation. Somehow, the goal is the synthesis and the development of various experiences about participation, involvement, sharing and so on, focusing on the key contribution that they give to building social cohesion. As already said, from the Nineties, urban planning in Italy has increasingly shifted towards forms of bargaining, negotiation and consensual choices. In these processes, however, the dialogue with public institutions was reserved only to the strong powers that, of course, have stated their own interests of profit at the expense of the overall efficiency of the urban system. The term system is not accidentally used, since the widespread use of the "partial variant" neglects the effects that each intervention produces on the entire urban system. By operating in this way, equilibrium sought through the harmonious relationship between the localization of activities and their urban loads might be undermined. The planning process should move to concrete participatory practices in which weak subjects, citizens and groups of interest are placed in real conditions of representing their real urban
needs and of participating in the transformation of those places they live in. United Nations reserve to underdeveloped countries some funds supporting bottom-up planning and auto-construction.\textsuperscript{6} If these types of programs can be implemented in terms of technological and economic scarcity, then they can be carried out in rich and developed countries, where the share of social marginality is less and circumscribed. Moreover, it should be stressed that in the West Countries of the world, the absolute and relative values of social exclusion are increasing and it should be noticed that in addition to the increase of traditional weak categories (poor, old, disabled, etc.) that have no rights within the current Italian cities there are the immigrants too. These ones, besides the common discomforts of weaker categories (work, home, etc.), are also characterized by discomforts linked to different customs, traditions and culture that, in many cases, affect the place they live in. The conspicuous presence of "immigrants" is not new in cities since new residents coming from elsewhere have always joined the natives. Migrations are an integral part of the human race, although at different times of social history the transfer from one place to another was marked by different motivations and dynamics (exploration, conquest, colonization, religion, poverty, and the list goes on). Anyway, by mixing or clashing different communities and ethnic groups the nowadays-worldwide geography comes out (Dusi, 2000). In reference to the oldest statistical documents, Marco Romano underlines that the urban "immigrant" population stood on average at around 50% (Romano M., 2000) until the Eighteenth century. Nowadays, proportions are definitely lower\textsuperscript{7} but difficulties linked to the cultural dialogue, to the meeting of diversity and to the urban sharing is greater than it was in the past. For several years, both Italian and worldwide scholars have investigated and discussed about urban exclusion and participation and, by consequence, they have examined the difficulties faced by immigrants when they arrive in a new city (with a different culture) and they seek to fit into the socio-economic system and in the urban life. They questioned about the effectiveness of UP in providing responses to the needs of a multi-ethnic, intercultural and polysemantic city (Beguinot C., 2007). We already mentioned that the UP does not operate in an independent way but it stems from political projects and, therefore, in the case of the interethnic city, it descends from the political project of acceptance and integration of new cultures or, conversely, of exclusion and marginalization. At the same time, multiple and interdisciplinary contributions are needed in order to outline specific scenarios. Knowledge provided by urban sociologists, environmental psychologists, epistemologists, anthropologists, historians, semioticians, pedagogues and so on is essential for both the understanding of the phenomenon and for the configuration of actions and processes able to make the natives not feel invaded and the immigrants not feel rejected. According to this, natives and immigrants can have time and space to "adapt" themselves to an identity that
will be new to both of them and, for this reason, it will be able to become the common identity, the common town. It is necessary, then, to build the ability to communicate one’s own needs and to listen and to understand the reasons and the needs of the others who can be fearful and suspicious neo-immigrants or inhabitants lacking urban tools, or experts of other fields. Each of the involved actors plays a role in a different stage of the decision-making process and also in the elaboration of the plan. They show their own needs, reveal their dreams and listen to the dreams and needs of the others, with a willingness to address and resolve the contradictions and conflicts that inevitably can occur. It should be stressed that the leading role is still in the hand of political and administrative decision-makers and that UP is still a technical device able to translate their decisions into organizing spaces and into ruling the implementation of the interventions. If "radical rethinking of planning practices" (Sandercock L., 2004) means that restructuring must be participative, then you cannot but agree. But we have to question about the possible risk of confusion in attributing to urban planning, and to the urban planner, a role that is not in its responsibility. The action planning, as well as any other action, operates within the democratic system of belonging, therefore, we must not confuse good and bad decision-making processes of a political system with the strengths and weaknesses of a UP: we must not therefore confuse socio-political criticism with disciplinary criticism (Mazza L., 2008). If specific laws are enacted (like the ones that assign a leading role to the economic power, that ratify the predominance of the particular interest, that do not protect the environmental quality, that are not geared to sustainable development and so on), the responsibility cannot be attributed to the UP. For example, if policy makers chose for nuclear power, it is not possible to impute the choice to the specialist who evaluates the optimal locations for the construction of power plants and deposits of waste; if in the plan housing and services for the lower classes are not provided, it is because neither the State nor the local Authority have proposed them. The fence of a park is not due neither to the planner nor to the designer who at most can be blamed for the aesthetic quality; criticisms should be turned towards administrators, police and many others who have decided to "solve" in this way degradation and safety problems (Jacobs J., 1969).

**Conclusion**

Although it might seems oversimplified, it is possible to affirm that in order to make a good UP it is necessary a good society that together with a good culture is able to activate a good policy. It should always be remembered that after the UP there is the implementation and the management of the plan. This means that even if the project arises from the bottom, it has to be necessarily shared and made right from the top, because policy makers are responsible for its definition and implementation.
References


Notes

1 Paul and Henri Davidoff Lefebvre were, with numerous essays, among the most accurate researchers of the relationship between urban planning and power; in Italy the debate developed mainly on sectorial magazines (especially Urbanistica e Urbanistica Informazioni) where several researchers of the time, including Piccinato, Astengo, Portuguese, Zevi, etc., expressed their personal positions.

2 In Italy the various federal laws, although with some differences, include, in addition to a GIS for monitoring territorial changes, a range of sector plans. In particular, the sector plans to be attached to the UP are: urban traffic and parking plan, energy plan, acoustic based zoning plan, trade plan, garbage management plan, risk plan, UP Strategic Environmental Assessment (SEA) and Environmental Effects – Implications - Assessment (EEA). The set of all sector tools gives a further contribution to build resilient cities, that in order to become like that must be sustainable cities.


7 In 2009, in the EU, immigrants make up about 10% of the population.
ABSTRACT Professional bodies are mandated to reflect on their core body of knowledge and to adapt their practice to face new challenges. Landscape architecture is no exception. There has been a significant rise in the use of the word “resilience” in the research literature in recent years, although it is still a relatively new term in urban planning debate (Porter and Davoudi, 2012). Work around resilience is evolving as a powerful notion transcending both the natural and the social sciences (Wilson 2012) and interdisciplinary discourse on resilience now includes consideration of the interactions of humans and ecosystems via socio-ecological systems. This paper considers how new ideas arising from resilience studies could be used in the practice of landscape architecture.

An EU funded project, "TURAS" (transitioning to urban resilience and sustainability) brings urban communities and businesses together with local authorities and researchers to collaborate on developing practical new solutions for more sustainable and resilient European cities. One strand of this project considers the resilience of human communities, particularly at the local level, where actions influencing resilience are the most tangible. One output from this research is an emerging framework for adaptive co-management and design as a means of transferring urban resilience into mainstream practice. This paper examines the TURAS framework and its objectives through the lens of the discipline of landscape architecture and considers where ideas of social resilience and the practice of landscape architecture intersect. One of the innovations currently being trialled, the “Geo-timeline”, is discussed.

KEYWORDS: Community resilience; Adaptive co-management and design; landscape architecture; Geo-timeline.

Introduction

While scientists continue to debate whether-or-not we have entered the geological era of the anthropocene (Crutzen and Steffen, 2003), the challenges that we face as a consequence of our impact on the global ecosystem show no sign of abating. Climate change, resource depletion, population growth, pollution and urbanisation present formidable global challenges for humanity (ARUP, 2014) and such complex environmental issues demand input from a range of different discipline areas. Those involved in the practice, education or research associated with such disciplines have to re-evaluate their
approaches and priorities. Landscape architecture is no exception and has to reflect on its relevance in a changing world (Davis and Oles, 2014).

**Resilience**

Many different types of resilience are described in the research literature (Plodinec, 2009) with the term often associated with concepts relating to survival and preservation of a perceived equilibrium state in the face of crises such as extreme weather or financial crashes (Shaw, 2012). Never-the-less work around resilience is evolving as a powerful notion transcending both the natural and the social sciences (Wilson, 2012) and interdisciplinary discourse on resilience now includes consideration of the interactions of humans and ecosystems via socio-ecological systems. Socio-ecological resilience goes beyond a capacity to absorb shock, embracing a potential for ‘renewal, re-organisation and development’ (Folke, 2006, p.253), rejecting notions of equilibrium states. Complex urban systems share many of the characteristics of ecological systems (Holling and Goldberg, 1971) and social-ecological resilience is considered a mechanism for change and understanding the dynamics of the city so that it can be managed ‘towards a desirable trajectory’ (Wilkinson 2011, p.158). However, it is observed that there are few examples of the explicit application of social-ecological resilience thinking in urban planning contexts in the literature (Erixon et al. 2013), and it is not clear what social-ecological resilience ideas mean in practice for urban policy (Ahern, 2011; Wilkinson, 2012).

**The TURAS Project**

Recent research being carried out as part of the EU FP7 TURAS project (Transitioning to urban resilience and sustainability) aims to gain insight into the implications of social-ecological resilience thinking on urban planning and policy by presenting a unique perspective that has been developed collaboratively between academic, local government and Small and Medium sized enterprises (SMEs) partners. The discipline of landscape architecture is represented within the academic and the SME partners. One result of this collaboration is the development of a framework for adaptive co-management and design as a basis for the operationalisation of urban resilience. This framework consists of three categories: ‘Understanding the system’; ‘Operating within the system’; ‘Efficient resource management’, each with associated objectives (Crowe et al. 2015). See Figure 1.
Adaptive co-management combines the dynamic learning aspect of adaptive management where the priority is develop techniques not just to manage and change a system, but to learn about the system, with the vertical and horizontal linking aspects of collaborative management (Plummer et al. 2012). It is suggested here that the operationalization of urban resilience also requires the creative approach to problem-solving and sense-making, and reflection on what solutions and directions are ethically and socially acceptable provided by the emerging approach of co-design. This accommodates a broad range of design modes from diffuse (non-expert) to expert design, where people are actors in the process and not simply users, and networks (uncoordinated) and coalitions (coordinated) are created that operate on different scales that are interlinked and interdependent (Manzini, 2015).

The objectives identified in the framework provide a useful starting point to see how the tools used in landscape architecture practice intersect with promoting community resilience.

The Challenge for Landscape Architecture

For decades the landscape architectural profession has been restricted by limited expectations of its scope, and the supposition of its role as a "green remedy" and "compensation for the pressures of urban life" (Prominski, 2008). In the intervening years since the Centre for Landscape Research’s conference in 2000, “Multifunctional Landscapes—Interdisciplinary Approaches to Landscape Research and Management” the
global challenges of biodiversity loss and climate change mitigation and adaption have
grown in urgency, requiring integrated and innovative policy making. The publication of the
Millennium Ecosystem Assessment in 2005 and the widespread adoption of the concept of
‘ecosystems services’ formed one early response (MEA, 2005). The ecosystem approach
(EA) provides a conceptual framework for looking at whole ecosystems in decision-making
and for valuing the ecosystem services they provide (DEFRA, 2007). In terms of the
concept of landscape and its evolving definition, one of the most significant changes during
this period was the ratification by most European counties of the European Landscape
Convention (ELC). As well as providing a comprehensive definition for “landscape” as “an
area perceived by people” (COE, 2002), the Convention broadened the interpretation of its
meaning, shifting the emphasis from visual amenity to the consideration of landscape as a
resource in its own right (Landscape Institute and the Institute of Environmental
Management and Assessment, 2013). Furthermore it clearly established that “landscape”
was not some restricted place of note, but that the term embraces the everyday, the
ordinary, the degraded as well as the special. Implicit in its definition is an inclusion of the
urban as well as the rural. At a disciplinary level it has been suggested that the ELC should
be seen as “a clarion call to landscape architecture to re-evaluate its old assumptions and …
to engage more closely and creatively with the many other disciplines who also have an
interest in understanding and shaping our common landscape” (Bell et al. 2012 p.2). This
assertion adds to the chorus of voices that have spoken out during the profession’s history,
and challenges educators to question if our current educational approach is fit for purpose.
The practice of “reflection-in-action” is one of the defining qualities of a profession (Schön,
1991). A review of the landscape literature reveals on-going discourse and recurring shifts in
emphasis about where the educational focus should lie. An historic debate centred on where
the discipline positioned itself with regards to science and art/design. Meyer, writing in her
work “The Expanded Field of Landscape Architecture” (1997), challenges the landscape
profession’s tendency to see the world in binary terms, such as aesthetics and science, art
and ecology, or culture and nature. She suggests that such absolute dichotomies potentially
blind us “from seeing complex webs of interrelationships” (Meyer, 1997 p.45). Recent
reflection on future directions for the profession note the emergence of such “crossover”
professional disciplines as urban design and landscape ecology as a response to the
contemporary environmental challenges we face (Roe, 2012 p.299). The evolution of
movements such as landscape urbanism and ecological urbanism has arisen from a more
integrated response to new complexities (Prominski, 2014). Analysis of the changing
concerns of North American landscape professionals expressed in surveys from 2013 and
2014 (source the ASLA blog “The Dirt”) reveals the growing focus on sustainability and
climate change. This issue now exceeds concern expressed about the quality of design professionals.

Discussions around new directions for landscape architecture is nothing new (Barnett, 2013; Benson and Roe, 2000; Waldheim, 2006). At its core the term “landscape” embraces the relationship between humans and their physical surroundings. While for some the word landscape is a contested term, the ELC explicitly contains the notion that landscape is primarily a mental construct. For this reason the notion of “Landscape” often engenders strong emotions and it has been noted that, for the general public, “it is at the landscape level that changes in terms of land-use, naturalness, culture or character become meaningful and recognisable” (European Environment Agency, 2005 p.36). Over millennia, humans and their activities have shaped the landscape and, it is suggested, “the fluid and unfixed character of land uses and landscapes – a result of complex and closely interwoven natural and human processes – can be brought into line with concept of resilience” (Plieninger and Bieling, 2012:xiv). Selman (2012a), too, makes reference to spatial resilience, describing the similarities between socio-ecological systems and “real-world landscapes”. Selman describes how individual adaptive cycles are nested in a hierarchy across time and space and how these might have a stabilising effect as a result of their providing memory of historically and spatially linked cycles that allow recovery and re-stabilisation after change occurs (Selman, 2012b).

One of the requirements of the TURAS project is to develop a toolkit of techniques, or innovative practices that build upon a citizen-led collaborative planning process. The accelerated process of urbanisation, one of the “grand challenges” facing society, represents a significant disturbance to a socio-ecological system. Wilson (2012, p.79) proposes that a local community can be understood as a social system with specific inherent qualities shaped by the memory contained within the system, memories linked to individuals (personal life history) and stakeholder groups (acquired memory, communal memory). He calls this “social memory”, a concept used by historians investigating the connection between social identity and historical memory. Territorial identity is a fundamental part of belonging that is not necessarily lost in the rapid process of urbanisation, with Giddens (2010:xxiii) identifying that “the more the world becomes global, the more people feel local” and that “people identify themselves primarily with their locality”. Rotenberg states, “one becomes attached to places emotionally or intellectually through associations that one builds in the mind between memories, narrative and monuments” (2012:241). New urban communities bring together individuals’ disparate experiences with a spatial area with its own history. The ambition of connecting these two phenomena initiated one of the innovative practices arising out of the TURAS framework for adaptive co-management and design; the
“Geo-timeline”. This tool aims to make visible the changing situation of urban neighbourhoods. A timeline is a well-established technique to display a list of events in chronological order and is often used in education to understand the order of events. Such an approach also has a well-established history of use in landscape architecture where the publication “Landscape Architecture; An Illustrated History in Timelines” uses graphics and mapping to communicate the history of environmental design (Mann, 1993). The practice of landscape architecture frequently uses a timeline as a means of graphically communicating the evolution of a site in spatial terms, revealing the essential palimpsest as different land-uses wax and wane.

Based on this idea, a community driven timeline has been developed by one of the TURAS partners, (the University of Nottingham). Using web-based free and open-source technology it is intended that this tool will empower local communities to better comprehend their locality, i.e. to understand its narrative and therefore be better equipped to influence their future in any participatory planning process. Timelines are one of the core elements of the Resilience Workbook for Practitioners (Resilience Alliance 2010).

The potential benefits of the Geo-timeline include:

- Facilitating easy communication between multiple stakeholders over time.
- Providing a visual record of the lifetime of a project.
- Creating a visual petition to promote non-economic values of project
- Generating data on use / users / inputs and outputs over time.
- Promoting pride in the community by highlighting positive aspects from history and the recent past.

The Geo-timeline is currently being trialled on demonstration sites in two European cities where there are new urban communities (Dublin and Nottingham). It will be tested to establish its potential role in:

- Fostering community identification with the locality,
- Encouraging community cohesion via participation in the construction of the timeline,
- Stimulating greater public participation/stakeholder engagement.

Knowledge of the past can be used as a powerful catalyst for future development. Making use of a site’s history has a long tradition of being used to generate landscape design schemes with multiples meanings, uses and interpretations. The conventional practice of landscape architecture often uses the analogy of palimpsest to influence design strategies. The orthodox approach to design in landscape architecture is by the “survey/analysis/design model, and the evolution of the site’s history would traditionally be recorded at the survey stage by a chronological series of maps recording change over time. The aim of the TURAS research, and specifically the web-based open-sourced Geo-timeline is to enable a “bottom-up” development of an understanding of a site’s history. For decades there has been unease
at the growing gulf between the professional planners and designers who shape the urban fabric and the urban inhabitants who use it (Jacobs and Appleyard 1987). Twaites et al. (2013:14) describe the common issue where urban communities are “the recipients of aesthetic and technical expertise and less as acknowledged participants in the generation and management of the places that they use”, and calls for a human-orientated approach to contemporary urbanism and the promotion of a community–led bottom-up participation.

**Conclusion**

Landscape has been regarded as the synthesis of “habitat and history” (Aalen et al. 1997). This research considers that both the memories carried by the new community and records of the past embedded in their new location can both be used to foster community resilience by creating individual links with a new environment, promoting group activity to develop social cohesion, and equipping communities to better engage in stakeholder participation. A re-examination of the TURAS Framework for adaptive co-management and design highlights those general objectives that are potentially met by the development of the Geo-timeline tool.

**Table 2. A re-examination of the TURAS Framework for Adaptive Co-management and Design highlighting those objectives met by the Geo-timeline.**

(Adapted from Crowe et al. 2015).

<table>
<thead>
<tr>
<th>Category</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the system</td>
<td>Facilitate active observation</td>
</tr>
<tr>
<td></td>
<td>Make information accessible</td>
</tr>
<tr>
<td></td>
<td>Identify drivers of change</td>
</tr>
<tr>
<td></td>
<td>Adopt broader value systems</td>
</tr>
<tr>
<td>Operating within the system</td>
<td>Adopt less hierarchical approaches</td>
</tr>
<tr>
<td></td>
<td>Collaborate and supportive networks</td>
</tr>
<tr>
<td></td>
<td>Build community capital</td>
</tr>
<tr>
<td></td>
<td>Adopt incremental and experimental approaches</td>
</tr>
<tr>
<td>Efficient resources</td>
<td>Build local awareness</td>
</tr>
<tr>
<td>management</td>
<td>Connect people, resources and places</td>
</tr>
<tr>
<td></td>
<td>Use what exists optimally</td>
</tr>
<tr>
<td></td>
<td>Design for change</td>
</tr>
</tbody>
</table>
Recent years have seen a wealth of community initiatives where grass-root activities can influence the use and management of urban open space. For example, research on community gardens has highlighted their role in building social capital because, unlike an allotment garden, they are created and managed by the community itself. This collaborative process necessitates a cohesive social network to develop (Hancock, 2001). North (2013) identifies the potential role urban open space can play in transforming local communities and urban settings, but notes that the outcomes of this process is not as well documented as the “canonical” large scale parks. We have to challenge the sometimes-peripheral position held by landscape architecture where its customary role is often the short-term option of design expression and the production of schemes that mitigate rather than adapt (Venturi, 2012), and where practitioners may focus on the “parcel” scale rather than consider the cumulative impact of their work (Austin, 2014). Participatory planning and management within landscape settings provides important opportunities for social and institutional learning relating to the generation of new knowledge. The framework for adaptive co-management and design identified in the TURAS project indicates further avenues of exploration and a future direction for landscape architecture as it adapts its traditional practices to embrace the challenges that are emerging associated with promoting community resilience and encouraging bottom-up processes within the broader practice of urban planning.
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**Notes**

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The Social Value of Place: An appraisal method for sustainable neighbourhood development

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ABSTRACT The recent decades have seen an increasing emphasis on a more comprehensive understanding of neighbourhood resilience, one that combines physical assets and social structures. Neighbourhoods are formed by the synergies between their physical and social structure. Individuals and groups connect to place physically and emotionally and knowing how society values public places is vital to implement sympathetic schemes that positively enhance health and well-being and in turn, increase social resilience. In order to deliver more sustainable developments at the necessary pace given the recent housing crisis, research needs to find pragmatic ways to transfer emerging theories and paradigms to practice.

This paper introduces an appraisal method that correlates an appraisal of the physical quality of place with an appraisal of the social value of public spaces by key actors of local community groups. The method is one of the components of a wider multidisciplinary system-thinking study based on an ecological urban model still in process. A pilot study was carried out in The Meadows, Nottingham, UK. The results highlighted correlations between the socio-political and the physical structures of the neighbourhood. Furthermore, some discrepancies appeared between the data emerging from current urban appraisal techniques and the social value of public places method. This suggests that current urban design practice might be biasing key data through the application of traditional methodologies that focus only on the physical structures of place.

KEYWORDS: Social sustainability; social resilience; social value of place; neighbourhood development; Placemaking; public engagement; appraisal method.

Introduction

The quality of the public realm is one of the core tenets of urban design theory. Many authors (Cullen, 1961, p.29; Alexander, Ishikawa and Silverstein, 1977, p.106; Jacobs and Appleyard, 1987, p.118; Hedman, 1984; cited in: Ewing and Clemente, 2012, p.7) have identified the importance of public spaces being defined by the buildings and other elements around them. A sense of enclosure helps humans identify their surroundings and establish their position in space, mentally mapping ways around it. Legibility has similar connotations in terms of the human response to space. When a place is easily understood, navigating it becomes a relaxed experience (Ewing and Clemente, 2012, p.18). Kevin Lynch (1960, p.3)
describes legibility as the ability to recognise the component parts which help us map special patterns and navigate the place; edges, landmarks, centres, focal points and paths, all help us do that but they must form part of a coherent system in order to allow the mental interpretation (Ewing and Clemente, 2012, p.35, p.20). And yet, Marshall and Corcoran (2014, p.5) found that 85% of their surveyed population felt that the quality of the public realm had a direct impact on their lives. Correspondingly, a range of methods for appraising the quality of the public realm have been developed, for example ‘Character Appraisal’, ‘Qualityreviewer’, ‘Capacitycheck’ and the widely used ‘Placecheck’.

Marshall (2014, p.4) however, argued that these approaches are no longer appropriate as they only focus on the physical aspects of place. The study of social resilience is best interpreted with a socio-ecological approach involving: people; place; and connections between people/with place (Christensen & Robertson, 1980, cited in: Kirmayer et al., 2009; Jewkes & Murcott, 1996; Hunter et al., 2009; Hamdi, 2010, p. 130; Ginige & Amaratunga, 2013, pp. 13-29; Creasy, Gavellin & Potter, 2008, p.37; Rowson, Broome & Jones, 2010, pp. 1-6; Colantonio & Dixon, 2012, p. 242; Giuffre, 2013, p. 20; Ophiyandri, 2013, pp. 99-10).

Conversely, the built environment has been poorly theorised in areas of social research (Woolsey Biggart & Lutzenhis, 2007) and more multidisciplinary approaches are needed (Domenski et al., 1992; O’Hara, Shandas & Velazquez, 1999, pp.65-84; Ring, Klauer and Wätzold, 1999, p.2; Vliet, 2000, p.190; Colfer C. et al., 2001, p.390; Fuad-Luke, 2009, p.23), and although some emerging studies (Colantonio & Dixon, 2012, pp. 240-242; Mclean, Chuthill & Ross, 2013, pp.1-6) account also for social structures, their application in practice has been complex (Allmendinger & Haughton, 2009, p. 621).

Social ties are also a key aspect of happiness and well-being, one of the goals of sustainable development, and it involves the psychological status of an individual in relation to their physical, social and economic environment (Gardner and Prugh, 2008; cited in: Corral, 2010, p.78). Therefore the links between people and place have been traditionally studied with a focus on psychological factors however, studies also need to include social aspects at a community level and in the context of social capital, participation and empowerment, which can help understand how the value people assign to their places translates into behaviours and action for community protection (Mihaylov and Perkins, 2014, p.71). Socialising at five or ten minutes-walk from home is crucial to peoples’ well-being, how relaxed they feel, how they connect with others sharing common territory and how they feel a sense of belonging. Similarities and relations amongst people sharing spaces create a unique sense of community identity (Hopkins, 2010, p.119).

This study correlates an appraisal of the physical quality of place with an appraisal of the social value of public spaces by key actors of local community groups. Ewing and Clemente (2012, pp.2-3) developed an assessment method based on scoring urban design qualities in
a scale of 0 to 5 (none to excellent) in public places. They found that these can be consistently appraised by people with or without training, giving valid and reliable results. The quality of public places goes beyond the excellence of the actual materials and landscape, many spatial attributes make places special and change people’s attitudes and behaviours in that space (Ewing and Clemente, 2012, p.3). Ewing and Clemente’s method was adjusted to the scale and nature of the case study.

The appraisal methodology outlined in this paper for the first time, is aimed to inform neighbourhood schemes and it comprises three stages of analysis that use both quantitative and qualitative methodologies: 1) Place assessment; 2) Social network analysis, and 3) Social value of place mapping. The method involves techniques imported from other disciplines (sociology, anthropology and environmental psychology) and adapted for application in urban studies.

One of the best ways to understand the value communities give to their places is to research amongst groups that have these place-emotions on the surface, either because they feel their places are under threat or because they lost them. This happens after large neighbourhood developments, when people is forced to re-establish their relationship with the physical environment (Mihaylov and Perkins, 2014, p.64; and Toombs 2001; Forester, 2006, p.126; cited in: Seamon, 2014, p.14). The Meadows, located in Nottingham, England, is a neighbourhood undergoing a radical physical transformation for the second time in history and it is therefore an appropriate case to test this method. Currently with a population of circa 14,669 (OSN, 2011), The Meadows initially developed in Victorian England and in the 70s was subject to radical regeneration. During the 80s and 90s, it gained bad reputation for its crime and unsociable behaviour. An ambitious Neighbourhood Plan was produced in 2009 causing alert amongst a population once damaged in the past. The neighbourhood has been the subject of other studies by the authors.

1) Place Assessment

This stage involved the application of standard appraisal methods currently used in urban design practice: a) Historic archive and mapping analysis, and literature review; and b) Current character appraisal, socioeconomic analysis, mapping analysis, systematic observation of level and nature of social contact and activity; c) Quantitative urban design qualities assessment in all neighbourhood public places (scale from 0 to 5: none, poor, average, good, very good, excellent respectively). This was carried out with a hybrid method, taking the principles of Placecheck, due to its simplicity and flexibility, initially to define the appropriate variables, and introducing Ewing and Clemente’s rating scale and measuring process afterwards. This combination allows for a case-tailored systematic collection of
quantitative data which can be used in combination with social studies methods.

The outcome of this appraisal was a standard place analysis including maps and qualitative and quantitative data regarding processes and patterns of local resilience, socio-economic profile, physical structure, activity and use of place. Key public places that might act as social hubs, providing a space for people to meet and carry on activities, were identified.

2) Social Network Analysis

This involved community network analysis: a) Social network identification and mapping: through observation, talking to neighbours, visiting venues, attending open meetings and activities; b) Engaging networks: contacting one key actor involved in each one of the networks; conducting semi-structured interviews to find out the origin, nature and dynamics of networks; engaging the wider network in focus groups through the key actors; c) Semi-structured discussions: conducting a series of questions during focus groups to trigger conversations about participants’ engagement and other affiliations they might have, length of participation, nature and tightness of relations and social dynamics of the neighbourhood. Sessions were recorded. The outcome of this analysis was a map of existing networks including strength and length of social ties, social support levels and overall social cohesion performance.

3) Social Value of Place

The method for capturing the social value of place involved: a) Mapping exercise: through a series of questions, participants were asked to identify places of emotional value (love, care/stewardship, apprehension/fear, and anxiety) in a neighbourhood map; b) Conversations: participants were invited to have discussions about those places. Sessions were recorded. The outcome of this exercise was a series of maps, and quantitative and qualitative information about the meaning and value public places have for local people.

Key findings

1) Place Assessment

The urban design quality indicators that best related to the neighbourhood were identified in stages 1.a) and 1.b). These were: Adaptability, Centrality, Meaning, Linkage, Activity, Interaction, Visibility, Access, Signage, Refuge, Legibility, Comfort, Natural features, Surveillance, Amenity, Enclosure, Landscape, Materials, Street furniture, Lighting, Upkeep (all ranked with a 0-5 scale in all public places found in task 1).

Sub-areas with two characteristic urban patterns were found: a) The New Meadows: Present in the 1970s/80s residential development; and b) The Old Meadows: Present in the
pre-modern and contemporary developments. It was observed that both patterns trigger social engagement at different levels. In the Old Meadows, where the streets are facing each other in relatively close proximity more activity and casual contact was observed at a street level. People doing their daily shop, waiting for the bus, walking the dog or taking children to school, were casually greeting each other and having short conversations. In the New Meadows, fewer people were observed on the streets and they had minimal or no contact with each other, with the exception of the shopping precinct, where some people talked to each other. Table 1 below summarises some of the characteristics found.

Table 1. Comparative characteristics of urban typologies found in The Meadows.

<table>
<thead>
<tr>
<th>Residential type α (modern)</th>
<th>Residential type β (Victorian)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. 58% of the households.</td>
<td>Approx. 42% of the households.</td>
</tr>
<tr>
<td>Overall good feel, quiet and relaxing, suburban.</td>
<td>Overall good feel, rather active, urban.</td>
</tr>
<tr>
<td>Key asset: landscape.</td>
<td>Key asset: housing quality.</td>
</tr>
<tr>
<td>Neglected and under-utilised in-between areas</td>
<td>Land used efficiently, no redundant spaces.</td>
</tr>
<tr>
<td>Unnecessary street furniture. Boundary treatments fragmenting the place.</td>
<td>De-cluttered. Boundary treatments are clear without fragmenting the place.</td>
</tr>
<tr>
<td>Minimal social interaction and activity on the streets.</td>
<td>Moderate casual/spontaneous social interaction and activity on the streets.</td>
</tr>
<tr>
<td>16 places acting as social activity hubs.</td>
<td>6 places acting as social activity hubs.</td>
</tr>
</tbody>
</table>


2) Social Network Analysis

Eleven social networks were identified. Key actors were well linked and took ownership of the engagement process based on their experience working within the community; this led to wide, representative participation. The study of how key social networks operate in Old and New Meadows showed that both areas have comparable levels of social cohesion, social ties strength and length. The levels of contact, participation and social support, are also similar. However, looking at what might be the triggers of social cohesion, it was observed that more casual contact and activity occurred in the Old Meadows at a street level, whilst in New Meadows, there were significantly more organised activities in public places such as community buildings and parks. See figure 1 for a summary of the data.
3) Social Value of Place

Four out of the eleven networks identified agreed to participate in the study. Neighbours across focus groups identified the places they valued the most. Unanimously, neighbours said they loved places where they spent time taking part in social activities, such as the community centre, the art pavilion and the shopping precinct. They also added significant emotional value to places of historic interest such as Victorian landmark buildings and derelict sports pavilions. Natural features such as the river waterfront, the recreation grounds and Victorian green infrastructure also scored high values, although the primary feeling these places triggered was stewardship. People also cared about their streets, particularly if they were in disrepair or if they impeded circulation. Neighbours in New Meadows did not seem to regard streets as places where they could meet and socialise. Neighbours in Old Meadows displayed more stewardship and spontaneous appropriation attitudes; they added flower pots and benches to the street scene. Figure 2 (below, left) shows the type of places neighbours value the most overall. When asked which public places neighbours would prioritise for investment (care, time and money) they chose the places they valued, although the urban qualities in those places were low. The most salient urban quality in places people loved was Amenity. Natural Features scored higher in places that triggered stewardship sentiments, such as Queen Walk's park and boulevard. Neighbours said they felt anxious over places subject to eminent redevelopment, which are also those with low urban design qualities such as the new tram line and the old pavilion in the recreation grounds. Places where neighbours felt fear coincide with the location of reported crime in the area. These places showed the highest overall value of urban qualities with the exception of Landscape, Materials, Street furniture, Lighting, Upkeep, which scored low values. Table 2 (below, right) shows the mean value and the salient variables for the urban design qualities appraised in the places neighbours valued the most.

Fig. 1. Activity in social hubs in The Meadows in relation to the number of households.
Conclusion

Studying social networks and physical aspects of place with a system-thinking approach in The Meadows enabled the identification of some synergies between urban patterns and social cohesion. Two contrasting urban patterns deliver similar levels of social cohesion through different forms of social engagement: in Old (Victorian) Meadows, where streets are narrow and terrace houses face each other, contact happened casually at a street level. In New (70s) Meadows, where there are more spaces between houses and the street pattern is irregular, significantly higher levels of organised activity and engagement took place in public buildings, and very little street contact was observed. This suggests that patterns where streets encourage spontaneous social interaction are more efficient in delivering social cohesion, as smaller public efforts and fewer public buildings are needed.

The social value of place task showed that neighbours’ values are based on the significance places have on their daily lives and not on the urban qualities. Neighbours value places for social gathering, with local meaning, with natural features and streets, in that order. The most salient urban qualities appraised in valued places were: Amenity in places people love; and Natural Features in places people that trigger stewardship sentiments. Neighbours feel anxious over places subject to eminent redevelopment, and they feel fear in areas of reported crime.

Further research is needed to explore the broader application of these method however this study demonstrates the importance of appraising the social value of place in existing neighbourhoods, a kind of data that urban design appraisal methods often fail to capture.

### Table 2. Mean value and salient urban design qualities on places neighbours value the most.

<table>
<thead>
<tr>
<th>Questions of task 3) Social Value of Place</th>
<th>Urban Design Qualities appraised (task 1- Place assessment*) on places selected by neighbours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The order below corresponds with order of formulation during the task</td>
<td>Mean Values with highest score</td>
</tr>
<tr>
<td>Area (mean value)</td>
<td>2.73 * Mean values (scale 0-5)</td>
</tr>
<tr>
<td>1 Places people love</td>
<td>2.97 Amenity</td>
</tr>
<tr>
<td>2 Places where people feel fear (also where most crime is reported)</td>
<td>3.36 Enclosure - Refuge Centrality - Interaction</td>
</tr>
<tr>
<td>3 Places people want to care for</td>
<td>2.61 Natural features</td>
</tr>
<tr>
<td>4 Places people feel anxious about (also to be redeveloped soon)</td>
<td>1.53 Lowest scores for all variables</td>
</tr>
</tbody>
</table>

Fig. 2. Type of places neighbours value the most in The Meadows (No of votes).
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What Does Community Resilience Look Like in Practice? How institutions see the role of communities in responding to heatwaves in the UK

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ABSTRACT The concept of resilience is well-established in policy, as well as popular and professional discourse. The notion of community resilience, though, is relatively new, and has only recently been taken up in policy (Cabinet Office 2011b; Defra 2012; 2013). Twigger Ross et al (2011) define community resilience as an ongoing process of communities working with local resources – alongside local expertise – to help themselves and others to prepare for, respond to, and recover from emergencies. However, when regional and national policy documents mention community and voluntary groups – and local residents – the roles of these actors in developing and implementing resilience are not clearly explained. The documents tend to focus on infrastructure development and institutional emergency responses (Greater London Authority 2011; Defra 2013; UK Government 2013; Public Health England 2014b).

In this context, community resilience seems to be something that is bestowed on passive communities by active local institutions; all of the local agency of Twigger Ross' definition is lost or missing. The challenge that policymakers face in trying to define the roles of communities in resilience raises various problems. Research and practice in a range of domains (and over a long period) highlights the limits of institutional responses, and emphasises that community-led action and other forms of public participation and engagement can effectively complement institutional responses (Arnstein 1969; INVOLVE 2005; Twigger Ross et al 2011; Cinderby et al 2014; DECC 2014). An active community with local agency could play a key role in preparing for, responding to and recovering from emergencies.

KEYWORDS: Community resilience; policy; community-led; institutional response; local institutions; emergency; heatwave; London; vulnerability; action research

The challenge of heatwaves in the UK

This paper is a literature review that has a particular focus on one form of extreme weather which provides a challenge to community resilience - heatwaves in the UK. There is a strong evidence base about the risks to health from excess heat that is consistent from around the world (Public Health England 2014a, 2014b). Increasing temperatures in excess of approximately 25°C are associated with excess summer deaths in the UK, with higher temperatures being associated with greater numbers of excess deaths (mortality above what
would be expected based on the non-crisis mortality rate in the population). During the summer heatwave in Northern France in August 2003, unprecedented high day- and night-time temperatures for three days resulted in thousands of excess deaths, initially estimated as 15,000 excess deaths in France (Public Health England 2014b) and 2,000 in England (Kovats et al, 2006) although subsequent estimates put the figure as high as 70,000 excess deaths across all of Europe (Robine et al., 2008). The main causes of illness and death during a heatwave are respiratory and cardiovascular diseases.

While vulnerability to heat is multi-faceted, the elderly, the ill and disabled, and more deprived social groups are typically the most vulnerable, especially those living alone, as well as babies/infants (Lindley et al 2011). The Intergovernmental Panel on Climate Change (IPCC) predicts that as a result of climate change, it is very likely that heatwaves will increase in frequency, duration and intensity (IPCC, 2012). The UK Climate Change Risk Assessment (Defra, 2012) notes that there is likely to be an increase in the frequency and severity of extreme weather events (e.g. floods and heatwaves) and states that “hot weather accounts for around 1100 premature deaths a year in the UK. By the 2050s, this figure is projected to increase by between 580 and 5900, with the greatest risk in London and southern England.” It states that healthcare provision may also be affected by heatwaves if temperatures in hospital wards, care homes and medicine stores are not effectively controlled, and overheating may impact on UK infrastructure in various ways – for example, through higher energy demand for cooling, heat damage / disruption to energy infrastructure, and failure of water supplies.

**Institutional plans for mitigating and responding to heatwaves**

When national and regional policy documents relating to heatwaves in the UK are reviewed, three trends are apparent: firstly, a substantial amount of policy effort has been put into developing emergency responses. This is to be expected; the Civil Contingencies Act (2005) requires Category 1 responders (e.g. local authorities) to maintain plans for preventing emergencies; reducing, controlling or mitigating the effects of emergencies in both the response and recovery phases; and taking other action in the event of emergencies (Cabinet Office, 2011a). Many policy documents are based on the Heatwave alert levels developed by Public Health England (Public Health England, 2014b). Local authorities have developed plans with a clear list of actions to take at each level, as a heatwave becomes more likely and as the risk of a severe heatwave rises.

The second trend is that these institutional plans focus almost exclusively on actions that public bodies can undertake. In light of their statutory obligations, it is unsurprising that local and national policy documents first address the roles of public bodies; but it is surprising that the role of other actors (businesses, civil society etc) is not further developed. Documents
such as the Heatwave Plan for England (Public Health England, 2014), and the London Resilience Partnership Adverse Weather Framework (London Resilience Partnership, 2014) almost entirely focus on action by public bodies, and refer to a ‘multi-agency’ approach of multiple government agencies, rather than multiple societal actors.

Thirdly, when longer-term planning is detailed, it tends to focus on infrastructure development rather than any kind of community involvement or planning. For example, the Mayor of London’s climate change adaptation strategy puts forward a number of actions to mitigate heatwaves, which include protecting and extending green space; creating breeze pathways that enhance natural ventilation; orientating streets and buildings to provide shade in summer and passive solar gain in winter; and upgrading the existing housing stock to reduce the risk of overheating (Greater London Authority, 2011). As policy on infrastructure, buildings, housing and utilities is complex, multi-actor, long-term, and crosses numerous policy domains it is unsurprising that it is often not entirely clear in these policy documents who will have responsibility for ensuring that the risk of overheating is addressed.

What role for community resilience?

It is perhaps unsurprising that institutional plans and organisations focus on multi-agency, institutional responses to heatwaves (and other emergencies), as many public bodies have statutory duties to prepare for disasters. Almost all of the emergency plans focus on clear, step-by-step actions which will allow public bodies to effectively co-ordinate and fulfill their responsibilities to the public. Their failure to include community groups in their plans in a meaningful way, though, raises various problems, as research and practice in a range of domains (and over a long period) highlights the limits of institutional responses, and emphasises that community-led action and other forms of public participation and engagement can effectively complement institutional responses. Drawing upon case studies of emergencies in the UK, Twigger Ross et al stated that a failure to appreciate the complexities of communities can lead to a waste of local knowledge and expertise, lack of trust in authorities and divisions in communities (Twigger Ross et al, 2011).

INVOLVE have noted that ‘beneficiaries of public policy can add value to its development and implementation’, and cited a number of benefits that public participation can bring to policymaking, including democratic legitimacy, accountability and enhanced governance, more efficient and better services that meet real needs and reflect community values, and helping to build stronger communities (INVOLVE, 2005). Other sources have described the varying degrees of citizen participation in the policymaking process (Arnstein, 1969), and have documented initiatives that have successfully involved communities in energy and environmental issues in their area (Cinderby et al 2014; DECC 2014). An active community
with local agency could play a key role in preparing for, responding to and recovering from emergencies.

The role of communities in institutional plans and structures

Communities, the voluntary sector and individuals are mentioned in policy documents related to heatwaves, but the roles of these actors in developing and implementing resilience are not clearly explained. The influential Heatwave Plan for England (Public Health England, 2014b) does have a specific list of actions for the ‘Community and Voluntary Sector & Individuals’, but seems to envisage communities as an extension of public bodies; the actions recommended for communities mirror those for local authorities, including:

- ‘Develop a community emergency plan to identify and support vulnerable neighbours in the event of a heatwave’ and ‘Assess the impact a heatwave might have on the provision and use of usual community venues’;
- ‘Support the provision of good information about health risks especially with those vulnerable groups and individuals’;
- ‘Keep an eye on people you know to be at risk’; ‘stay tuned into the weather forecast and keep stocked with good and medications’ and ‘check ambient room temperatures’.

Communities (and to a lesser extent businesses) are almost entirely absent from other policy documents. One example is the London Resilience Partnership Strategy and delivery plan for 2013-15 (London Resilience Partnership, 2013). One of the few mentions of community is a vague action to ‘Promote community resilience initiatives by London resilience partners’. Performance measures against these are to ‘Understand current activities to promote individual and community resilience being carried out by partners’ and ‘Link with these initiatives to boost recognition of London resilience’. At best, this is mapping of activities and external promotion of the London Resilience Partnership; at worst, it seems like communities have been added as an after-thought.

Communities are not only absent from institutional plans; they often have a very weak presence on institutional bodies that respond to heatwaves. A review of the membership of the London Resilience Partnership (London Resilience Partnership, 2013) shows that it is dominated by ‘Category one responders’ (such as the Emergency services, Greater London Authority, Local Authorities, Health Bodies and Government Agencies) and ‘Category two responders’ (including utilities, health bodies, transport organizations and the Health and Safety Executive). Community groups are only mentioned in a category called ‘other responders’, where the ‘voluntary sector’ and ‘faith sector’ are mentioned. This is mirrored in the make-up of other organizations that deal with extreme weather, or promote resilience.
The Mayor of London’s climate change adaptation strategy states that “No single authority is individually responsible, or capable, of increasing our resilience to climate risks. To effectively sustain and even increase our resilience, we need the climate to be routinely considered in all significant decisions and more joint working across the public, private and voluntary sectors” (Greater London Authority, 2011). Policymakers will need to make significant changes to their plans and community engagement strategies if they are to enact the multi-level governance and complex social picture this statement encapsulates. As the London Resilience Partnership’s Adverse Weather Framework states “The response to any emergency is conducted in partnership” (London Resilience Partnership, 2014).

Communicating with the public

Twigger Ross et al (2011) noted that the term ‘community’ has been considered by policymakers in emergency response as self evident and unproblematic, and synonymous with ‘the public’. They stated that civil contingency institutions do not seem focused on engaging with communities in the context of emergencies, with one-way information flows planned from state bodies to the public, allowing for little feedback from members of the community or organizations, with no discussion of messages or implications. This is backed up by our review of policy documents relating to heatwaves, which shows that most emergency plans envisage a simple flow of information outwards from a central point. This fails to address the complexity of communities and the local nature of many emergencies. Twigger Ross et al (2014) specifically uses the riots in Peckham in 2011, and snow and ice in Gloucestershire over 3 successive winters 2008-11 to highlight examples of where community trust in authorities broke down, and a failure to incorporate two-way information flows and community engagement limited the effectiveness of emergency response.

Research specifically on heatwaves underlines the problems for policymakers. Research with older people in London and Norwich (Ambrahamson et al, 2008) found that intended target groups for messages about heatwaves many not be receptive to messages from public bodies; few of the respondents that Abrahamson and colleagues interviewed (aged 72-94 years) considered themselves either old or at risk from the effects of heat, even through many had some form of relevant chronic illness, and ‘do not think of themselves as the intended recipients of heatwave warnings’. Secondly, Abrahamson et al found that the ‘vulnerable’ people that heatwave plans are meant to target may not see state-led intervention as desirable or useful; some respondents fully endorsed the role of the state in protecting the population at risk, but others believed that state intervention was ‘uncalled for, intrusive, patronizing and infringed upon or threatened individuals independence, or was an inappropriate use of resources.’
Investigating community resilience: Urban Heat

In response to these challenges, the authors have initiated the Urban Heat project. This 18-month project has the objective of developing community-led resilience to heatwaves in vulnerable areas. It will examine how community-led responses can be articulated, practised and realised, and will attempt to integrate these with the existing plans of local institutions. The project draws on action research and co-creation methodologies, and will consist of three case studies, all focusing on areas of London in which disadvantage is relatively high. Inner London (Dalston, Hackney), between inner London and the outer suburbs (Tooting, Wandsworth) and suburban London (Ivybridge housing estate, Hounslow).

Conclusion

This paper has demonstrated that heatwaves are a long-term public health concern for the UK, and has explored how the role of communities is envisaged in policy documents. It has shown that policy documents tend to focus on emergency response or infrastructure development, and focus on the actions that public bodies can take – often excluding communities, or viewing them as an extension of state intervention. While policymakers working in civil contingencies and emergency planning have often viewed the idea of ‘community’ as self-evident and unproblematic, this paper has highlighted evidence that a failure to consider the complexities of communities and to involve them in planning can limit the effectiveness of emergency response. The difficulty of communicating key messages to vulnerable populations means that even the limited action that is contained in emergency plans (one way communication with ‘the community’) may be ineffective. The paper concludes by proposing an innovative methodology for articulating and realising community-led responses to heatwaves, noting the varied evidence on the limitations of institutional responses, and calls for institutions to include communities in their preparation, planning for and response to emergencies.
Acknowledgements

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References


Session 9

Co-Production 1
Participatory Mapping in the Co-Design of the Future North

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ABSTRACT It is important for designers of the built environment – from the varying scales of architecture, urbanism, and landscape – to capture and reflect locally specific human voices in the anticipation and design of future communities in the face of great change. The world is increasingly challenged with the complex dynamics of climate change and globalism. This is particularly acute in the Arctic where warming temperatures increase access and potential exploitation of natural resources, and has related socio-cultural and environmental impacts.

The Norwegian-Russian borderland has a rich and diverse cultural history that is as informed by place as by the many people populating its fjords, valleys and plateaus. A variety of resources, from minerals to fisheries to oil, have shaped and continues to affect the character of the region in varying degrees. How do people here anticipate and respond to changes and contribute in the co-design of their physical and social realms? Further, do or can the neighbouring communities of Vardø and Kirkenes, Norway, and Nikel, Russia, engage with and learn from each other in this regard?

This paper is a component of ongoing PhD research based on a residency at the Barents Institute in Kirkenes that investigates the participatory co-design potential of a locative-mapping tool, MyBarents.com, which was developed by community activists in nearby Murmansk, Russia. The online platform enables the plotting on an interactive map of ideas for civic improvement that can be up-voted, tweeted, or discussed in a forum. The aim of the platform is to enable visual and accessible communication of ideas between diverse community members, and reveals potential to instigate change. Participative observation and semi-structured interviews, key components of ethnographic research, are paired with the innovative locative-based social medium to capture both broad and deep discourses on public engagement in shared community futures. Together, these tools are explored to document and understand a particular cluster of Arctic cultural landscapes, and the synergies and divergences that occur within. These in turn aim to influence design professionals and decision makers at formal and informal levels.

KEYWORDS: Participatory mapping; locative media; co-design; ethnography in design research; Arctic urbanism and landscape; public participation; collaboration; Kirkenes; Nikel; Vardø

Introduction

Highly fluid and dynamic forces of climate change, globalization, technological development and related socio-environmental shifts are constantly challenging our cities and
landscapes, and these challenges are most legible in the highly sensitive Arctic regions (Jegorova, 2013). The Arctic Council defines resilience as the capacity of social, economic, and environmental systems to cope with sudden or chronic disturbances, and responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (Sommerkorn et al., 2013). Participatory processes are supported by the European Landscape Convention, a political document that encourages collaboration and wide participatory engagement in the planning and development of landscapes in all their manifold conceptualizations and manifestations (Jones, 2007). Notably in our context, Norway was the first signatory, while Russia has thusfar abstained. Nonetheless, local city planners in Nikel are interested in MyCity and the citizen engagement process (Molodtsov et al, 2015). The adherence to such signatories is often token at best, so how can spatial designers engage the heterogenous voices of the North in the co-design of the future?

The intersection of altering forces upon Arctic places requires a meeting of disciplinary methods and approaches to reveal multiple knowledges to counteract disturbing forces. Research on people in built environments has consistently intersected with and appropriated methodologies from other academic fields that study humans, with ethnography as a useful approach in understanding individual perspectives at every scale of the built environment, from homes to public spaces (Southworth et al., 2012). Architecture professors Eleftherios Pavlides and Galen Cranz advocate specifically for ethnographic methods to be utilised in architectural projects to capture the ‘diversity of human experience in buildings’ (2012). They point to the labour intensive aspect of such methods that typical contemporary architectural practices are unable to employ given the swift deadlines of the contemporary building construction industry. To this end, they call for a creation of a database or repository of ethnographic architectural knowledge to be shared among social scientists and architects (Pavlides and Cranz, 2012). Sociologist Saskia Sassen challenges the rigid notions of the architecture and planning professions and calls for urbanists to navigate multiple forms of knowledge and seek out new typologies that consider the highly entwined new virtual and social terrains of society in the globalized hegemony (2005). Architectural theorists Nishat Awan, Tatjana Schneider, and Jeremy Till further this notion in Spatial Agency:Other Ways of Doing Architecture, a physical book and parallel online collection of essays, projects, and practices that expand the definition of architecture beyond the limited physical and aesthetic form to encapsulate all the ephemeral aspects of social space as social construct, as rooted in Lefebvre (2013).

The Future North project is funded by SAMKUL, an initiative of the Research Council of Norway that aims to spur such collaborative research in mapping the cultural conditions for societal change. The Future North team is a partnership between the Oslo School of
Architecture and Design (AHO) and the University of Tromsø Barents Institute, and is comprised of social scientists, architects, and designers with an aim to map the landscape futures of the North. Within this framework is my associated PhD research fellowship contingent on the interdisciplinary bridge between the design profession and the social sciences. My residency at the Barents Institute enables me to situate myself within the physical places being studied, key to classic social science methods of ethnographic inquiry, particularly by ensuring long-term immersion and participant observation, but also providing ample room to follow the local pace and schedule interviews and workshops (Marcus, 2008).

What is the relationship between ethnography, a method that aims to describe a culture or social setting, with that of the designer?

Methodology
Design anthropologist Joachim Halse succinctly describes this approach for spatial design professionals:

Ethnographies of the possible are a way of materializing ideas, concerns, and speculations through committed ethnographic attention to the people potentially affected by them. It is about crafting artifacts that link the imagination to its material forms. And it is about creating artifacts that allow participants to revitalise their pasts, reflect upon the present, and extrapolate into possible futures. These ambitions lie in the borderland between design and anthropology. For designers involved in this type of process, it is a new challenge to craft not beautiful and convincing artifacts, but evocative and open-ended materials for further experimentation in collaboration with non-designers. (2013)

How can spatial designers such as planners and architects add participatory locative media to their suite of tools? The term ‘locative media’ was coined in 2002 at a net art workshop dedicated to exploring “collaborative cartography of space and mind, places and the connections between (Tuters, and Varnelis, 2006).” A new generation of location-aware people is rising with the abundance of digital media associated with location, and increasingly the worlds are seen as inseparable (Theilmann, 2010). The online mapping platform, MyCity, weaves digital and physical space together with social and mental spaces. MyCity becomes a “technology of the imagination” that allows us to appreciate the diverse contributions through which concrete imaginings of particular visions and concerns are generated in design events (Halse, 2013). The enduring presence of the virtual aggregate of ideas can evolve over time in concert with the changing attitudes, visions and direction of the community. Ideas can be continuously added to the map, and ideas can be continuously
discussed and voted upon. The plots on the map reveal the intimate knowledge and experience of people in relation to various physical sites through time.

Locative media is a complementary tool that aims to be accessible to a wider potential citizenry and capture major themes and issues reflective of local concern. I selected the communities of Vardø and Kirkenes, Norway, and Nikel, Russia as research sites for their mutual threads of peripheral yet historically strategic locations derivative of resource-rich lands, and their proximity and associated interplays within transnational Arctic space. Kirkenes and Nikel are both heavily characterised by mining, although Kirkenes is not as dominated by the sector. I included Nättäämö, Finland after living in Kirkenes for some time because it is close enough that local residents commonly visit it to for cheaper goods such as groceries, alcohol, and fuel, and because another international border community adds to the regional cross-cultural collaborative spirit of the project. Vardø was added because the Future North team was deeply engaged with a group of activist locals through the Vardø Restored project – a community generated initiative for the archiving and revitalization of the city. Ethnographic methods (guided and unguided walks, interviews, and mapping workshops) were already employed providing a ready-made laboratory for investigating participatory engagement in mapping and co-designing the local socio-spatial future.

**MyCity: Mapping the Future**

The MyCity platform allows users to tag their ideas for bettering their city on a virtual map (Fig. 1). These ideas may reference specific points on a map, but can also relate to bigger scales such as the block, the neighbourhood, the larger urban area, or even the region. The concept for this virtual platform emerged after an in-situ community workshop in Murmansk held by a student from AHO, Jan Martin Klauza, in March 2012 (Mitaki, 2015). A large map was placed on the wall and participants tagged their ideas for community improvement on it with sticky-notes. The map stayed on the wall for several months, and local digital producer Stepa Mitaki co-founded the MyCity platform based on this simple idea after noting the popularity of the map well after the meeting took place. Bringing this temporary physical and social event into the virtual realm enables citizens to continue contributing visions with the map as an on-going online idea repository and forum. It has since been picked up and used by local activists in several Russian cities, as well as by officials in some Northern European locales such as Tromsø and Espoo, Finland. I selected MyCity as a locative media tool as it was incubated from within my study area region with a nascent network of interested actors and thus was a tool that reflected existing cross-border exchanges. MyBarents.com is an innovative spin-off pilot, in that it links four different but closely located communities in the transnational border region in a single platform, as opposed to the other stand alone versions. These links are an attempt to allow users to easily navigate, explore and
participate in their own location while providing the opportunity to do the same in the realms of their distinctive neighbours. The platform provides an opportunity to explore public self-expression among communities that are tied together by geography but diverge by their exploited and unexploited resources, demographic makeup, and political structures. The cities in this study and in this particular transnational area contain surprising diversity and incongruity. Vardø faces the harbour, whilst Kirkenes turns its orientation from the sea towards the mine. Nikel is tucked inland in a heavily altered industrial landscape. A thick border divides Norway from Russia; physically in that there is a militarized no-stopping zone on the Russian taiga, and less tangibly in that there is a fair number of bureaucratic hurdles to obtain visas. Building typologies also shift; Scandinavian wood frame houses give way to concrete Soviet residential blocks. The delicate fishing infrastructure of Vardø contrasts to the imposing mining and port infrastructure of Kirkenes, which in turn is matched with even more formidable smoke stacks and tailings in Nikel. Participant observation as an ethnographic method informs much of the identity of the city, but how can locative media add to this interpretation? The ideas presented by the public in this online platform can reveal opportunities and challenges to be addressed collaboratively with spatial designers.

Discussion

At this stage, the MyCiy pilot, MyBarents, in the Norwegian-Russian border-zone has begun to generate local interest with active in-person engagement as well as social media
outreach activities. The developers of the app have begun exploring online and offline methods at engaging citizens in planning discourse and decision-making, particularly those not reached in traditional outreach programs such as workshops and public meetings. In Kirkenes, Vardø, and in Nikel, city planners are working to renew local city plans, with the former and the later actively engaged in participating in the MyBarents pilot.

The minimal detail on the base maps provide enough context for users to locate themselves while at once allowing their own cognitive maps to fill in and navigate their city; their demarcated idea punctuates the map with a vividly coloured dot. These become larger and darker in hue as they are voted up. The ideas start to reference important spatial points, and the city reveals its patterns in the location of ideas, which is more noticeable in larger centres using the MyCity platform. When an idea is implemented the dots can switch to green. In Espoo and Tromsø, city officials are actively engaging in the platform discourse as they develop their plans, a move yet to be developed in MyBarents as officials monitor the success elsewhere.

The ideas plotted thus far on MyBarents are overwhelmingly infrastructural in nature, including calls for added amenities of various scales, from new park benches and street signage to more visionary projects such as port relocations and fjord-crossing bridges (MyBarents.com, 2015). They appeal to exploiting the physical and historical character of the place. For example, one user plotted a memorial trail that represented the tales of a famous local poet. In Kirkenes, suggestions include a king crab themed informative children’s park, extended ski trails, recontextualization of wartime relic infrastructure, and interpretive pathways for historical figures (MyBarents.com, 2015). The idea to shifting the face of Kirkenes from the mine to the sea in the development of the downtown waterfront is popular, and reflects an issue the municipality is already investigating (Stubhaug, 2015). In Nikel, improvements to recreational areas and facilities are common, with the most popular suggestion being the addition of scrubbers to the smokestacks (MyBarents.com, 2015). Political annotations have also emerged in the plots of both Kirkenes and Nikel, with rivalling ideological stances on the movement, removal or introduction of statues and banners for Lenin and Putin reflecting an evolving and very contemporary discourse (MyBarents.com, 2015). Vardø has few plots, but all suggest improvements to available services, employment opportunities or tourist development reflecting the desire to rebound from a long period of stagnation. Currently there is no aggregation tool within the platform to organise ideas by theme. The developers are investigating and testing various analytic tools that parse through the information, such as using word clouds or tagging ideas with identifiers that can collate and direct ideas by theme to the appropriate representative (Kreminsky and Mitaki, 2015).

Outreach to the general public on the availability of the platform provides an extra challenge. In order to engage potential new users of social media, interviews were done with
local newspapers to spread the word in print media. Being an online tool, it is clear that approaching prospective users via social media would be a viable route, with careful awareness of which media anticipated users are most likely to access (Kaplan and Haenlein, 2010). Given the widespread local use of Facebook on the Norwegian side, and VK on the Russian side, it was appropriate to discover local networks in both those media to post introductions to the media in the local language. Word-of-mouth is also an important method of reaching potential users.

There are several participants who could already be considered what sociologist Arvid Viken calls the ‘Barents elite,’ people who are directly engaged in the support and promotion of regional international collaboration and development, but are also focused on local levels, such as governmental institutions, notable business persons, and politicians (2008). It is no accident that these are among the first voices to emerge on the media, as the Barents Institute shares office spaces with the Norwegian Barents Secretariat, and collectively are networked with local business and political leaders. The Secretariat has also sponsored MyBarents.com as their mandate is geared towards engendering cross-border collaboration, and the tool emerged from within the Barents Region in Murmansk. Some of the contributed ideas of these so-called elite have clear implication towards the regional Barents character, thereby extending beyond the immediately local, such as a Barents thermometer to inform citizens of regional atmospheric conditions. Among these, however, are also ideas rooted in local context, such as the development of the waterfront, added benches along ski trails, and development of currently unused spaces into recreational assets. In my research I will look into whether the agenda of their official capacity informs their own everyday lived experiences as residents of the town, or vice-versa. With ideas being eligible to a public vote, can other community members claim the creator’s implication behind such community improvement in their act of support? Other MyCity platforms, such as in larger centres of Tromsø or Murmansk, have much greater participation by the wider public at the moment, and in many Russian cases the platform was instigated by community activists. There is thus potential for the platform to be widely accessible as a horizontal discourse of local place-making and futuring that targets people who may not attend workshops or city meetings and presentations. Yet it is conceivable that existing hegemonic forces could appropriate the tool to try to direct the dialogue, although this drawback could also be said of offline methods, or should the usual active community members be the only ones voicing their opinions. In an attempt to reduce the effect of voting up ideas ad infinitum, which would show misleading favourability of an idea, registration is required for the actual voting process requiring a unique email.
MyCity/MyBarents is still evolving, and does not reach the highest echelons of Arnstein’s classic Ladder of Participation, a device that measures whether a method of engagement measures from complete lack of participation to full citizen control (Arnstein, 1969). This method is somewhere in the middle rungs, reflecting an engaged level of consultation. To reach the levels of Partnership, Delegated Power or Citizen Control, the platform needs to engender a direct dialogue with officials, with explicit and reciprocated attention and action. The interviews and workshops will flesh out some of the narratives emergent in the locative media, and bridging this with mediated localities. In a constant back-and-forth between the developers and me, MyBarents is consulting the user-driven information and official and informal community planners to carve out a niche for their enterprise. They acknowledge the efficacy of merging online and offline methods to engage as many community members as possible in spatial planning, as some people may not actively be online, and others may not participate in public events. When the decision making process is increasingly given to the users, how does this affect the role of the design professional?

Architect Paul Jenkins acknowledges the different roles that have emerged over time between architects and other specialists in producing the built environment, and that this needs to be reassessed as architecture has an important social function that is often ignored. He argues that there is an essential value in widening social participation in the architectural process, and that a reassessment of the relationship between users or wider society and architect needs to be undertaken (Jenkins, 2010). There is fear among some architects and planners that giving more power to non-professionals/the everyday user challenges their tightly prescribed and coded roles in the spatial design process (Awan et al., 2013; Sanders and Stappers, 2008). However this fear could be assuaged as increased citizen participation and indeed authority in the design process does not equivocate to a levelling of skill sets needed in representation, design, and methods that the professional has become finely attuned to. There will always be a need for the design proficiency that these professionals have (Sanders and Stappers, 2008). The various participants and the decision makers combine local and professional knowledge to identify and address complex issues in hyper-mediated spaces in a contextually appropriate manner.

Conclusion

The adroit designer will be masterful at employing a panoply of methods, be mindful at listening to and engaging all non-designer co-creators, and tactfully negotiate contested themes as they transform multiple prognosticating imaginaries into palpable realities. Locative media such as MyCity/MyBarents provides a useful approach at fusing the physical, social and virtual worlds, and inviting and incubating the emergence of new ideas. They are not a substitute for other methods, nor can locative media stand alone as a single
informative tool. Participatory and locative media are among the many valuable tools planners and design professionals have at their disposal to broadly reach out and include disparate human voices and engender resilient communities, particularly Arctic communities facing a number of stark and immediate transformations. Platforms that are able to adapt simultaneously to local contexts and global changes will best be suited to give voice to some users that may not otherwise engage in the co-design of their communities.

References


ABSTRACT The Future Works project, based in the English Midlands is sparked by widespread concern about the future resilience of energy, work and making, in a region that has good claim to being the hearth of industrial manufacturing. The project is gathering communities at a series of factory sites to develop collaborative accounts of past, present and future energy system changes as they affect the workplace. In the context of the UK Climate Change Act's cross-party commitments to the reduction of carbon emissions, the project explores the changing relations with energy in industry and the role of co-production in these transformations.

Future Works’ aim is to invite a sense of shared ownership of the dilemmas and choices faced by a range of present-day industries with the prospect of a carbon constrained future. The paper will present initial work of the project that has drawn on past histories and memories, present activities and future scenarios to rethink how a range of people involved with industry can pro-actively engage with change. We have traced the transformations of materials, tools, skills and ideas, and engaged people’s creativity in addressing pressing questions around energy futures and the consequences of change for everyday life. The paper will explain the methodological and theoretical considerations that led to the decision to work with stories on the project and will plot some of the opportunities and challenges presented by this approach. We have been exploring the related notions of storyteller and toolmaker as we experiment with different ways of giving voice and agency to a wider range of people and things in building local resilience.

KEYWORDS: Energy; industry; community; resilience; co-production; stories.
communities. We will seek to explore conflicts of how the past of energy production is understood (e.g. the miners’ strike; pollution incidents); how new developments are considered (e.g. nuclear; fracking; windfarms) and the prospect of future constraints (e.g. power cuts; taxation; limitations). At the same time we will be working to present these communities with a rarely disputed proposition: that societies the world over are faced with pressing shared dilemmas. Stories of Change seeks to make space to work through disputes and identify routes to viable energy futures. The project is organised in three interconnected stories: Demanding Times: where it is bringing together existing communities of interest around energy policy and politics at a national level; Future Works, where it is uncovering accounts of the relationship between energy, industry and landscape in the English Midlands; and Everyday Lives where it is exploring how energy resources such as coal and wind have shaped life in South Wales. Each story is working with creative partners and communities, and these will be drawn together through an Energetic strand exploring storytelling as a way of researching.

The Future Works story is based in the English Midlands covering the region between the cities of Derby and Sheffield, and is sparked by widespread concern about the future of energy, work and making, in a region that has good claim to being the hearth of industrial manufacturing. It is gathering communities together at a series of factory sites in or near the Derwent Valley to develop accounts of past, present and future energy system changes as they affect the workplace. In the context of the 2008 UK Climate Change Act’s cross-party commitments to the reduction of carbon emissions, we are exploring the changing relations with energy in industry and the role of co-production in these transformations. Future Works is building on existing networks of people, energy resources and investment in the region. Our Project Partners include the Advanced Manufacturing Research Centre (AMRC) near Sheffield, Derby Museums, Gripple, John Smedley’s Ltd., Transition Town groups in Belper, Derby and Melbourne, and the Derwent Valley Mills Trust. The project has been developed through connections with three distinctive communities that have been under-recognised and under-researched in relation to energy debates: apprentices (through SMEs and the AMRC); employers and employees (through unions, the Chambers of Commerce and businesses); and volunteers (through industrial heritage and museum organisations). Future Works is convening energy stories (past accounts, present experiences and future projections) with these three communities via workshops, audio-visual interview, performance, scenario-making and small group discussions, at the sites of industry. Our aim in gathering these stories is to invite a sense of shared ownership of the dilemmas and choices faced by a range of present-day industries with the prospect of a carbon-constrained future.
Energy stories

Changes to energy production and use are central to UK climate change policy commitments that stretch to 2050. The targets in the 2008 Climate Change Act suggest far more than merely the deployment of marginally cleaner or more efficient products or services. Rather, they imply the wholesale transformation of society including geo-politics, livelihoods, technologies, and cultural norms. However, imposed changes to energy systems can further polarise and alienate (Van der Horst, 2007), can tend to neglect the diversity of everyday experiences of energy (Day and Hitchings, 2009), and can ignore its uneven geographies (Buzar, 2007). Contemporary national and international energy discourses seem oddly static when considered next to the pace of change in other aspects of contemporary culture. The aim of the Stories of Change project is to find creative and innovative ways of connecting research on energy with communities. Our response is to focus on the contribution that the human imagination can make to revealing and presenting energy-society stories of the past, present and future – that is through stories. Our work is founded on current progress in social sciences on, e.g. energy configurations as socio-technical systems (Walker and Cass, 2007), but also acknowledges, channels and charts the emotional, imaginative, symbolic territory in a way which social science tends not to.

Energy represents a third of UK carbon emissions, so the 2008 Climate Change Act commitments to reducing greenhouse gas emissions by 80 per cent by 2050, compared to 1990 levels, will represent a profound change in our relationship with it. In 2009, the UK sourced just over 2 per cent of its energy from renewable sources like wind power, solar or hydro, and despite pledges to increase this to 15% by 2020, this still leaves much to be decided in terms of meeting UK commitments. Questions of energy security, efficiency of new technologies, demand, ownership and costs make these issues more complex, even before we take into account our different understandings of what these things mean and what should be taken into account in deciding our way forward. In addressing the concerns and issues associated with energy and manufacturing, Future Works begins with notions of co-production, and co-design, which can be understood as socio-pedagogical processes. Our approach is informed by critical pedagogy and ideas of ‘transformative agency’, which recognises that it both creates and responds to shifting conditions and allows for the possibility of purposeful change (Kossak et al. 2008). For those involved at each of the factory sites, (employers and employees, apprentices and volunteers), questions of their resilience are closely entwined with energy futures. They are dealing with complex challenges in regard to the way energy is generated, supplied, and used, often planning many years into an uncertain future. Each of the people we have met has a different relation to energy and manufacturing – from those who repair machinery, to those who make things
using it, to those who choose when and with what to renew and make changes. We join-in, convene, and take part in these conversations, in order to bring new questions concerns, and framings, aware that each of these stories is provisional and evolving. In their telling we are drawing on past histories and memories, present activities and co-producing future scenarios to rethink how people involved with industry can pro-actively engage with inevitable change.

**Why Stories?**

We are working to discover and make stories, because they offer a popular and engaging route into thinking about possible energy futures (Smith et al.). Everybody can gather around stories. They allow novel syntheses and permit different disciplines to come together around a shared object of study. In other words we think that stories are powerful in the work they can do in permitting new forms of academic collaboration as much as in enabling collaboration between academic and civil-society partners. Our project investigates the ways in which stories can serve to connect communities, researchers, arts practitioners, policy makers and others in a shared exploration of the relationship between society and energy. We tell stories to make sense of events, to confirm our understanding and our feelings about them; and to explore alternative choices, leading to feared or desired futures (Kearney, 2002). Stories play a role in notions of community building (Freire, 1970), in constitutions of the self with community (Ricoeur 1995), and in the expressions of identity and experiences of place through objects (Pahl and Roswell, 2010). We are working with communities to elicit the stories that they want to tell, and the questions they might want us to explore further with our interdisciplinary capabilities. Stories have given this project its tone and its technique as we experiment with new ways of allowing demands to be heard and actions to be considered concerning ambitious goals around energy system changes.

In the process of making stories in Future Works the related notions of story-telling and tool-making are key. We are working with many others to reveal the agency of a wider range of people and things in understanding resilience and change. Historical work on proto-industries and factories in the region has helped to inform an exploration of energy-industry relations in the present and future. Responding to one historical query, this includes an understanding of how the proto-industrial and pre-capitalist past, prior to widespread use of fossil fuels, can be used to intervene in current political debates. We have drawn on law court oral testimonies and other archival material including ballads, early maps, diaries, for insights into the workings of customary culture, oral memory, story-telling, knowledge practices, embodied understandings of the environment, and how people have experienced change. Stories allow for an engagement with possible and alternative future scenarios in relation to global environmental change. They allow for more nuanced understandings of
space and time that bring together past, present and future human and non-humans in complex assemblages. The kinds of stories we are convening range from interviews, tour stories, scenarios, diary accounts, and many other shared experiences.

**Resilience**

The literal meaning of resilience refers to the ability to bounce back, and the concept envelopes a range of different responses to change, mostly drawn from ecological systems thinking, which includes reference to capacity, complexity, connectedness, adaptation and feedbacks (Brown and Westaway, 2011). In the field of built environment studies, ideas of resilience range from future-proofing cities through to its use as an organizing principle and core objective for community and personal transitions. In the event of disaster there are calls for increased resilience, or narratives about how resilient ecosystems, people and communities are in the wake of disturbance. Resilience, is both a malleable and pervasive term in discussions about uncertain futures. Engaging with debates around resilience is about how to both understand and respond to a world of rapid change, complexity and unexpected events. Ideas of transformation are at the core of debates around global environmental change and societal responses (O’Brien, 2012). If changes, particularly in the context of climate change, are increasingly understood as potentially radical, unplanned, detrimental, and inevitable they are also accompanied by an imperative for the implementation of sustainability along with planned and profound transformation, especially of energy and consumption (Kates et al, 2012). Our engagement with our project partners through stories reveals divergent meanings of resilience within varying challenges to industry and energy relations in the context of global environmental change. Working with stories has supported more transformative, inclusive and dynamic approaches to understanding energy transitions. It has allowed for a questioning of the status quo and opened up the possibility of the shared work of designing and shaping alternative futures.

**Resilience at t’mill**

There is always potentially trouble at t’mill – but what about resilience? Through our research we have started to understand the many different concerns, motivations and hopes of the different industries– large and small – we have been working with. It is also important to acknowledge that time and history are malleable and entangled in the different understandings of past, present and future relations of energy and industry. So, for example we prefer not to resort to chronology and refer to the Silk Mill, the site of the first factory as ‘past’, nor to other going concerns, such as G ripple and Smedley Ltd. as especially ‘present’, nor even some decidedly 2050–oriented outfits such as the AMRC as ‘future’. Each of the
factories we have visited have a much more complex relationship with time. Their past experiences, present possibilities, and future potentialities all contribute to diverse conceptions of resilience. Together with our partners we have been tracing the transformations of materials, tools, skills and ideas, and engaging with people’s creativity in addressing pressing questions around energy futures and the consequences of change for everyday life. The following brief accounts are taken from stories we are co-producing at the different factory sites involved in the project.

The Advanced Manufacturing Research Centre (AMRC) is engaged with defining the ‘Factory of the Future’ (Ridgway et al. 2013). The Advanced Manufacturing Park (AMP) site at Waverley near Rotherham has fascinating links to the past, present and future of industry, energy and manufacturing. The site, which incudes the Research Centre, Training Centre and Knowledge Transfer Centre is home to a set of factories, aerospace companies, machine tool developers, simulation software, computer, and firms working on nuclear power. The AMP is located at the site of the Orgreave Colliery– known for the ‘Battle of Orgreave’ during the 1984 miners’ strike. As a Catapult Centre it sits at the heart of debates around the future of UK manufacturing. While resilience is mostly understood in terms of investment in state of the art ‘Factory 2050’\(^6\), in training future apprentices and in reconfigurable production lines, their research has also revealed that the future might also be about distributed factories – not exactly a return to cottage industries but with important impacts for how societal connections are remade with industry and energy in mind.\(^7\)

John Smedley Ltd, Lea Mills, has a long history of 230 years of continuous manufacturing on the same site.\(^8\) John Smedley Ltd makes wool, cotton and silk clothing; primarily underwear before the introduction of central heating and later, as the need for extra (under) layers seemed to diminish, increased production of high quality jumpers, dresses and cardigans. It has been important for the company to think of the factory in terms of continuity and this helps with identity (and therefore brand resilience – hopefully continuing to employ a workforce that has been there for generations). However, such commitment also makes demands on how the company functions in relation to efficiency and energy (site, workforce, methods, tools etc.), and in compliance with the sustainability requirements of a Royal Charter company. Important choices on what to replace their old boiler with or whether to invest in the latest Japanese knitting machines are never far removed from everyday relations in the workplace. Their story suggests that resilience is about an attitude of responsibility and care.

Gripple is also ‘tied’ to its site by choice, and sees a responsibility to the city of Sheffield.\(^9\) This stance throws up multiple challenges: how to run a factory and house offices and research in historic buildings; what this means in terms of commitments about relationships with the entire supply chain, the workforce, energy consumption and global presence.
Gripple’s response is to promote future-oriented design thinking that has ideas of interdependence at its core. The company is also thinking about growth – aiming to double in size, build more, make more and also reduction—reduce consumption, condense activities, even shrink back to its original site. As an employee-owned company, everyone is expected to contribute to the creative evolution of the company, and there are no strict dividing lines between groups and activities. Gripple’s approach to questions of environmental impact and CO2, considered the impact of the company in an interdependent way, taking responsibility for their suppliers, supply chains and the working conditions of factories in other countries. The values embedded in the company’s ethos are key to the way it has made and negotiated decisions in the past and hopes to continue to do so into the future.

The Silk Mill in Derby has good claim to be the world’s first fully mechanised factory. As part of Museums Derby it has undertaken a radical shift in its agenda. The former Industrial Museum is ‘reinventing itself for the 21st century’, opening itself up as a convener for public initiatives (while still keeping some old bits of machinery running). Their approach to achieving resilience emphasises societal learning. This is conceived in terms of wider publics but also in terms of their relationship with industry, local SMEs and Rolls Royce. The Silk Mill’s resilience is often based on making these relationships work especially with growing concerns about cuts to Government support. There remains an inherent tension between industry sponsorship and their commitment to both global environmental change issues and widening participation. This is also, however, an opportunity for a public debate about what matters in a city of makers. There is a sense here that resilience is very much about the people not about safeguarding a historic building.

Sheffield Industrial Museums Trust is located at Kelham Island Museum in Sheffield, and its ideas of resilience are tied to running old machinery (including the most powerful working steam engine in Europe) and heating historic buildings. Investigations into the potential for hydropower on site in collaboration with community energy social enterprise ‘Sheffield Renewables’ have not yet lead to a successful proposal, and whether it will be feasible for the largely grant funded organisation remains an open question. As energy their biggest expenditure after staff costs, they suggest that with the replacement of their boiler imminent, much about their energy future seems uncertain. They are concerned that the Government does not have a clear long-term plan for energy, and changes in policy with successive administrations leading to a lack of continuity.

Strutts North Mill in Belper achieves its resilience through a devoted volunteer group that work with with transition groups and as part of other local networks. It puts research and learning at the top of its agenda. This means taking generations of schoolchildren
around the site to see buildings that made skyscrapers possible and hear about waterpower, which was critical in the 18th century ‘low-carbon revolution’. Volunteers understand the role of the historic mill in other important areas, for example with the University of the Third Age (U3A)\textsuperscript{11} and debates about society and energy use. One important connection it has is with the proactive Belper transition group and ADVyCE \textsuperscript{12} who are rethinking the importance of water, as a source of energy for the whole Derwent Valley region into the future.

Resilience at t’mill refers to ways of responding to clusters of concerns: the question of how businesses can plan long-term when governments and decision about energy are relatively short term; the problems of adopting certain technologies over others in times of rapid change; the adverse effects of global environmental change on supply chains; anxieties over automation in relation to labour; the distractions of ‘silver-bullet’ technological-fixes; and the obstacles to establishing relationships between important individual, collective and societal values.

Conclusion: What next?

Future Works has drawn on past histories and memories, present activities and future scenarios to rethink how a range of people involved with industry can pro-actively engage with change. The project is ambitious in wanting to make some of the concerns of our partners associated with energy and manufacturing more public, and in doing so encounter, and relate to these different stories in unexpected ways. We have already started to uncover stories that challenge the idea that industry is, has, and will be, tied to a carbon-based economy. A driving purpose of the project is to help to make the public and political conversation around energy to be both more plural and more dynamic. It also asserts the inevitability of change. An unstated strapline for the project is: ‘change is coming – what sort of change do you want?’ The community gathered around energy and industry is a powerful one even if it does not see itself as such, nor even as a community. We are also intent on co-producing stories with other kinds of overlooked communities, including humans of the past and future, and the non-human world. We don’t know how all these stories about energy, industry and resilience are going to end, but it’s already clear that they are going to be well worth caring about and attending to.
References


Smith J. et al. (forthcoming) ‘Stories of Change: An experiment at the intersection of policy, research, the arts and community’


Notes

1 Arts and Humanities Research Council (AHRC) Connected Communities ‘Stories of Change: exploring energy and community in the past present and future’ (AHRC award number: AH/L008173/1). This project is a collaboration between the Open University, the Universities of Bath, Birmingham, Exeter, Sheffield and South Wales, and the arts organisations TippingPoint and Visiting Arts.


3 The Oxford English Dictionary definition of resilience is: 1. the ability to recoil or spring back into shape after bending, stretching, or being compressed; 2. (of a person) ability to withstand or recover quickly from difficult conditions. The word originates from the Latin resilire ‘leap back’.

4 For example, the Future Proofing Cities project, http://www.futureproofingcities.com.

5 For example, The Transition Towns movement; see www.transitionnetwork.org for the UK and www.resilience.org for the USA.


8. Lea Mills was founded in 1784 by Peter Nightingale straddling a brook at Lea Bridge, just outside Matlock. See also blog post ‘John Smedley Ltd, Lea Mills’ 10 December 2014; https://storiesfutureworks.wordpress.com/2014/12/10/smedley-lea-mills/.


11. University of the Third Age is a trust with a set of charities run by volunteers throughout the UK. http://www.u3a.org.uk/.

Creating a Template for Change: A century of mapping underused spaces in Dublin

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ABSTRACT  The EU FP7 TURAS project seeks new adaptive and flexible approaches to urban planning and governance that can build social-ecological resilience in response to the convergence of crises. This paper identifies the mapping of underused spaces as an example, exploring the practice through reexamination of a map showing vacant sites in Dublin from 1914 influenced by Patrick Geddes (1854-1932) and a contemporary crowd-sourced web-mapping application, ‘Reusing Dublin’, developed by the TURAS Project.

Geddes recognized the potential of a multi-disciplinary, inclusive and interactive process of civic survey as a means to engage citizens with local issues, and by extension with global issues. Vacant sites were considered a resource for alternative uses and the 1914 Dublin map of vacant sites provided a management tool for change in response to a severe housing crisis.

A century later, Geddesian thinking can be observed in contemporary ICT applications such as ‘Reusing Dublin’, which facilitates the mapping of underused spaces in a participatory civic survey process. Underused spaces are identified through existing inventories, student projects and online crowd-sourcing. Users can discover and share information on any identified underused space and connect with others in relation to any particular space. The website therefore empowers citizens to identify opportunities and self-organise, building adaptive capacity to change in an uncertain future. A network of underused spaces is revealed, providing a template for change within which communities can precipitate social-ecological innovation and therefore contribute to the transition to urban resilience and sustainability.

KEYWORDS: Mapping; Patrick Geddes; reusing Dublin; social-ecological systems; TURAS; underused spaces; urban resilience; vacant sites.

Introduction

The EU FP7 TURAS project (Transitioning to Urban Resilience and Sustainability) seeks new adaptive and flexible approaches to urban planning and governance that can build social-ecological resilience in response to the convergence of crises such as climate change, natural resources shortages and stressed ecosystem services. Urban resilience is understood as the application of social-ecological resilience thinking to urban planning and policy in order to provide innovative approaches to urban problem solving. It is observed that
there are few explicit examples of what urban resilience means in practice in the literature (Ahern, 2011; Erixon et al., 2013; Wilkinson, 2012).

The TURAS research reported here has a specific focus on underused spaces, which are considered to present opportunities for a city to reinvent itself (Bowman and Pagano, 2004). The mapping of these underused spaces is put forward as an example of an adaptive and flexible approach to urban planning and this paper explores this practice through re-examination of a map showing vacant sites in Dublin from 1914 influenced by Patrick Geddes (1854-1932) and a contemporary crowd-sourced web-mapping application, ‘Reusing Dublin’, developed by the TURAS Project.

**Patrick Geddes and the ‘Central Area Showing Derelict Sites and Tenements’ plan of Dublin (1914)**

Patrick Geddes is attributed a broad range of expertise including evolutionary biologist, ecologist, conservationist and town planner. Geddes was specifically interested in the interaction of man and nature at the local and global scale and clearly articulated an understanding of the relationships within and between social systems and ecosystems. Geddes applied this intelligence to the city in the region, which he considered the ultimate expression of the relationship between man and nature (Meller, 1990). It is suggested here that Geddes was an early adopter of social-ecological systems thinking and that his work may help provide some insight into what urban resilience means in practice.

Geddes observed the industrial city of his time as inefficient and polluting and described social consequences such as ‘unemployment and misemployment’, disease and folly’, ‘indolence and crime’ (Geddes, 1915, 86). He articulates a vision for an efficient and low impact future city with ‘a more subtle and more economic mastery of natural energies’ (Geddes, 1915, 93). In order to make the transition to this future city Geddes considered it essential to engage citizens with their place and therefore local issues. However, he noted that citizens were ‘half-blind’ to the city and its history (Geddes, 1915, 16-18) and set out to address this through two strategies that used geographical local knowledge as a mechanism for civic engagement: the civic museum and civic survey. Geddes believed that by understanding the local it would be possible to comprehend global issues and make local actions relevant (Macdonald, 2004, 65) and that change would result from the aggregation of local efforts, “city by city, region by region” (Geddes, 1915, 73).

The civic museum idea evolved into the touring Cities and Town Planning Exhibition, documenting the origins and development of urban civilizations through drawings, illustrations and models in an ‘encyclopaedic meta-view of all available knowledge’ (MacDonald, 2004, 62). The civic survey was to be realised through a multidisciplinary and interactive process that ideally involved the entire community in understanding all aspects of
the city and its drivers of change over time (Welter and Lawson, 2000). The survey was to provide a ‘diagnosis before treatment’ (Geddes and Mears, 1911, v) in order to avoid ‘designs which the coming generation may deplore’ (Geddes, 1915, 349).

The “Survey of Edinburgh” was the exemplar civic survey. Vacant sites were considered a resource for alternative uses and when the Cities and Town Planning Exhibition first visited Dublin in 1911 it included a plan of the Old Town of Edinburgh identifying 75 existing and potential open spaces for playgrounds and urban agriculture from 1908, and a plan of the entire city entitled ‘Directory Map – Vacant Lands’ showing “that 450 unused acres might be utilized” (Leonard, 1998, W7) from 1910 (Fig. 1). Both are attributed to Geddes’s Outlook Tower Open Spaces Committee with the former drawn and coloured by hand and the latter map consisting of a Post Office Directory ‘Plan of Edinburgh, Leith and Portobello, with suburbs’ overlaid by a transparent sheet onto which annotations were drawn by hand. This early geographic information system (GIS) was then recorded as a photograph on glass negative. The latter map specifically acknowledges the contribution of Mr Joseph Fels from Philadelphia, a soap millionaire, philanthropist, and supporter of the single-tax on land value as proposed by Henry George (1839-1897) (Short, 1997). This collaboration confirms that Geddes was very much engaged with proposals for land reform that promoted the productive and optimal use of land as a means to address the poverty and social injustice of the industrial city (MacLaren, 2001), and perhaps suggests that the map was to communicate how much land was not productively in use in a synoptic and visual format.

Fels was also founder of the Philadelphia Vacant Lots Cultivation Association and in a paper delivered to the Farmers’ Club London in 1906 he records that in ‘all our American cities there are vacant building sites, and sometimes whole squares, which are lying idle waiting for appreciation in value’ (Fels 1906, 1). Fels observes the environmental and social benefits of urban agriculture: “A large number of vacant, unsightly spaces became attractive centres of local interest and activity, the public became interested in thrift and co-operation;” (ibid.). These ideas would have resonated with Geddes, who saw gardening as a core activity for cultural evolution that engaged citizens in “vigorous health and activity, guided by vivid intelligence” (Geddes 1915, 99). Geddes and Fels corresponded regularly on their shared interests and it is also possible that the 450 acres in Edinburgh were identified for urban agriculture uses. Geddes had already been involved in developing numerous community gardens on vacant sites in Edinburgh, many of which can still be visited today. 
In Dublin, Geddes and his daughter Norah worked with the Women’s National Health Association (WNHA) on the reuse of vacant spaces, for example on a playground and garden at St. Augustine Street in 1912. The WNHA aimed to continue ‘transforming derelict spaces into centres of brightness and happiness’ throughout the island (WHNA, 1912).

The influence of the Edinburgh maps can clearly be seen in the subsequent plan of the ‘Central Area Showing Derelict Sites and Tenements’ in Dublin published in 1914, in the appendix to the report of the 1913 inquiry into The Housing Conditions of the Working Classes in the City of Dublin. The map locates a total of 1,359 derelict sites and buildings across the city (Fig. 2) and provides an informed basis for strategic planning to address a severe housing crisis, identifying numerous layers of information such as ‘Derelict Sites’, ‘Land available for building’, ‘Insanitary areas’, ‘Areas for which schemes are in preparation’ and ‘Dangerous Buildings’ (Dublin Housing Inquiry, 1914, 324-325), all illustrated in one singular synoptic view.
Geddes’s evidence to the Inquiry records that he considered the derelict spaces an opportunity for improving the health of citizens and for giving communities agency to look after their own local environment: ‘there is not sufficient recognition given to the fact that the people themselves are quite desirous of carrying out the improvements.’ (Dublin Housing Inquiry, 1914, 211). Geddes notes the sites were ideal for urban agriculture, and suggested all vacant land be reclaimed ‘in the public interest’ and allocated amongst the poorer classes in order to create a level of income (ibid., 211). This proposal would appear to reflect Henry George’s (1880) ideas that land belonged to the people by natural right, and that inequality in the distribution of wealth was core to social and environmental problems.

Mr E.A. Aston, a founder member of the Housing and Town Planning Association of Ireland, advocates in his evidence for a tax on derelict sites to encourage their use, and compulsory purchase powers for Local Authorities on sites that have remained vacant for over two years (Dublin Housing Inquiry, 1914). Again, these ideas reflect the discourse on land reform at that time, such as the Liberal Party’s proposed tax on the capital value of undeveloped land (Churchill, 1970).

The ‘Central Area Showing Derelict Sites and Tenements’ plan was therefore a management tool for the remediation of the city, diagnosed through the surveying process, that had the potential to support a number of activities including the strategic planning of a transformation of housing provision and the administration of a tax on land values or status. However, there is no indication that this map was generated through the type of dynamic...
and participatory process envisioned by Geddes in his writings on the civic survey.

‘Vacant and underutilized sites’ map (2013) and ‘Reusing Dublin’

A century later and Dublin is still characterized by vacant sites and buildings (Rose, 2014), there is a housing crisis in the private rented and social sectors (DoECLG, 2014; Barnardos, 2015), and there is a lack of green space in the city centre (Brennan et al., 2009).

In 2013, as if to commemorate the centenary of Mr E.A. Aston’s evidence to the 1913 inquiry, the Lord Mayor of Dublin proposed a vacant land levy for the city. Motivations originate from a recognition that existing tax mechanisms on property in the city effectively encourage vacancy and the incapacitation of buildings, and an understanding that the hoarding of vacant land was a contributing factor to the property boom as it led to a false impression of scarcity, artificially driving up prices (Quinn, 2013). The aim of the levy is to induce behavioural change, optimize the productive use of city land, and reduce urban sprawl (ibid.). The vacant land levy is included in the Urban Regeneration and Housing Bill 2015 (Government of Ireland, 2015).

‘Vacant and underutilised sites’ were mapped in a limited area enclosed by the city’s canals to provide an evidence base for the levy, and to develop new techniques of mapping and monitoring the sites (Rose, 2013, 4). The map uses three categories that target sites that currently are not subject to any tax regime: a site that is totally clear of structures; vacant land with dilapidated buildings; a site comprising mainly of a dilapidated building or buildings that are likely to be incapable of occupation (Fig. 3). The map was based on visual assessment in the field by planners who then collected information in relation to ownership, building condition, impediments to redevelopment etc.. This was then inputted into the Council’s internal GIS system.
The process of vacant sites mapping can present significant challenges not least from the scale of areas involved (McClintock et al., 2013; Johnson et al., 2011) and the fluidity of data (Pagano and Bowman, 2000). Dublin City Council experienced many challenges, particularly in relation to the accumulation, validation, maintenance and accessibility of data that McPhearson et al. (2013) suggest can often be addressed by local community participation. This process of ‘volunteered geographic information’ (VGI) can reduce dependence on data from government and provide more relevant and insightful information as local stakeholders will often have a more intimate knowledge of neighbourhood conditions than planners working with city government (Johnson et al., 2011). The TURAS project is exploring these ideas through a web-GIS application called ‘Reusing Dublin’ that is based on an evolving map recording spaces that are not used at all (vacant spaces), are only partly in use (for example upper floors above shops), or that could accommodate additional uses (for example roofs, walls or grassed areas) such as energy creation or growing plants for biodiversity. The project therefore aims to obtain a finer grain of information by mapping ‘underuse’ as opposed to simply ‘vacant’ (Fig. 4).

Underused spaces are identified in three ways: existing inventories⁴, student research projects, and crowd-sourcing. The student research projects engage with a specific area of the city and gather information from a number of datasets in order to locate underused
spaces and upload profiles to the map. Key datasets include commercial property valuation records, the GeoDirectory, the Registry of Deeds, and the Planning Registry. Sites are also identified through crowd-sourcing, drawing on the dispersed and often tacit knowledge within communities. Users simply add markers to identify underused spaces they know of.

![Image of Reusing Dublin website](https://example.com/reusingdublin.png)

**Fig. 4. Screenshot of www.reusingdublin.ie, 09 July 2015.**

Users of Reusing Dublin can click on any identified underused space to discover and share information (such as photographs and historical or ecological data) on any identified underused space or highlight errors. They can also connect with others in relation to any particular space. The website therefore empowers citizens to identify opportunities and self-organise, building adaptive capacity to change in an uncertain future, and promoting the efficient use of resources, multi-functionality and mixed use in space and time. The nuanced and detailed data gathered may make visible layers of ecological, social, historical and cultural value and meaning associated with a place.

Reusing Dublin aims to engage citizens with their place and one another through local community participation and geographical local knowledge. It is hoped that a network of underused spaces is revealed that forms an opportunity landscape for a broad range of actions that might be related to community uses, ecosystems services, food systems, energy systems, or intensification of use. The TURAS project is principally interested in how citizens use the site, what information is gathered, and whether or not people use the site to self-organise.

Early results indicate that Reusing Dublin has tapped into the considerable interest around underused spaces for temporary or more permanent cultural and ecological uses in the city. This is primarily evident in activity on social media such as facebook, twitter and
Events such as a re'cycling' tour of underused spaces and a weekly ‘site of the week’ have generated interest and successfully engaged stakeholders related to particular sites. However, active crowd sourced engagement such as adding sites or information is still very limited. There is evidently a requirement for resources to curate and manage the website and associated social media, and to engage directly and actively with stakeholders and citizens.

Discussion

It is suggested here that a re-examination of Geddesian ideas embodied in the ‘Central Area Showing Derelict Sites and Tenements’ in Dublin from 1913 provides a number of insights for the contemporary mapping of vacant sites as the 2013 map falls short of the more generous and imaginative social-ecological ideas espoused by Geddes. For example, to Geddes such a map was not simply an inventory for tax collection but a strategic tool to manage a severe housing crisis. Building development was not the sole aim as the sites were considered opportunities for addressing multiple challenges that in the present day could be related to food and energy systems, biodiversity, and ecosystems services. The civic survey was not a remote exercise by planning officials but an open and participatory process where data is continuously gathered by citizens. And critically, the 1914 map is not restricted to a central area and integrates multiple layers of survey information to provide a synoptic view. In systems thinking a synoptic approach facilitates an understanding of whole systems and their component and interrelated parts, providing a basis for considering effective and creative change (Meadows, 2009).

Reusing Dublin attempts to address these deficiencies and can be seen to reflect Geddesian thinking in a number of ways. The website engages citizens with local issues that can connect them with their place and one another, and by extension with global issues. The aggregation of data on underused spaces reveals an opportunity landscape for the remediation of the city in much the same way as the civic survey was a pre-requisite to future planning. In addition, the aim of helping citizens self-organise reflects Geddes’s observation that communities should be given agency to look after their own local environment.

Both Geddesian thinking and Reusing Dublin represent a move away from the heroic modernist masterplanner to a future where decision-makers and planners facilitate citizens in making direct contributions to data collection in a variety of areas (Johnson et al., 2011) in a ‘bottom-up advocacy process’ that can support environmental recovery in an uncertain future (Berger, 2006,14). Parallels can be drawn with many aspects of social ecological resilience.
thinking. These aspects include combining different types of knowledge for learning, experimentation, assuming change and uncertainty, and creating opportunities for self-organisation (Wilkinson, 2011), and therefore justify the description of Geddes as an early adopter of social-ecological systems thinking.

Conclusion

The mapping of underused spaces is an adaptive and flexible approach to urban planning and governance where information can be presented in a synoptic view and with other relevant layers of information in order to reveal connections and empower citizens to identify opportunities and self-organise, building adaptive capacity to change in an uncertain future. The mapping of underused spaces is put forward as an explicit example of what urban resilience means in practice. The re-examination of the work of Patrick Geddes illustrates that many of today’s challenges, conditions and solutions are not entirely new, and that Geddesian thinking can provide insights for contemporary practice. Geddesian thinking has been shown to have influenced the development of a crowd-sourced webmapping application, Reusing Dublin, that aims to address many of the challenges of mapping underused spaces through an open and participatory process that respects local knowledge and engages citizens with local issues. The resulting map of underused spaces can provide a template for change within which communities can precipitate social-ecological innovation and therefore contribute to the transition to urban resilience and sustainability.
References


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Notes

1 Personal communication, 2014, with Sofia Leonard, former Director of the Patrick Geddes Centre, Edinburgh.
2 A copy of the ‘Ninth annual report of the Philadelphia Vacant Lots Cultivation Association: season 1905’ and a paper entitled ‘Farm Colonies’ by Joseph Fels, delivered at a meeting of the Farmers’ Club London in 1906, are archived as part of the Patrick Geddes Papers at the University of Strathclyde. References 23/15/11 and 23/15/12.
4 Existing inventories include the DCC Derelict Sites Register, a list of buildings at risk from an Taisce, DCC Vacant Land Study, and an existing online mapping called ‘Dereliction Dublin’. Around 480 sites from existing inventories have been uploaded to Reusing Dublin.
5 The Reusing Dublin application was launched on 17.04.15 and 12 weeks later there were 540 followers on twitter.
Session 10

Urban Resilience
ABSTRACT Urban rivers are often at the heart of urban settlements, and resilience combined with adaptability have become key concepts in contemporary approaches to urbanism (Picket, Cadenasso et al. 2013). This paper focuses on the dynamic and sometimes problematic relationship between rivers and the built environment, and explores how adaptability and resilience might shape the design of urban forms along rivers. This will draw on an on-going PhD study that provides a critical review of urban riverside industrial sites in Europe in relation to sustainable regeneration strategies. The objective of the study is to identify a conceptual framework to inform the decision making process for the urban regeneration of riverside sites.

In cities throughout Europe the resilience and adaptability of rivers has been tested through historic transformative processes, from their instrumental role providing industry with power and sewers and their more recent rediscovery as prime locations for new urban developments and leisure. With the departure of heavy industries from cities, urban river corridors, also referred to as ‘blue’ corridors, have over the past thirty years changed rapidly in land use and perception (Holzer, Hundt et al. 2008, Prominski, Stockman et al. 2012). At the heart of the development of urban ecology, urban rivers demonstrate the resilience of natural processes but also their role in providing sustainable places to live in. Rivers have a major role to play in mitigating the impact of climate change and the urban heat island effect, and provide restorative urban open spaces. They are instrumental in urban regeneration and the catalyst for innovative approaches to issues such as flooding and the creation of new urban neighbourhoods (Marshall 2001, Geoff Petts, Heathcote et al. 2002, Kibel 2007).

KEYWORDS: Urbanism; rivers; resilience; adaptability; regeneration.

Introduction
Urban rivers have often been instrumental in the origin of human settlements because they provided essential resources including water and food, natural irrigation, sanitation and defence as well as facilitating circulation and transport. With the development of industry, urban rivers became a source of energy and cooling treatments as well as providing a free sewage system. They became more and more controlled, built up and sometimes forgotten, inaccessible behind industrial buildings. More recently and since the decline of industries in Europe, urban rivers are being re-discovered for their amenity value. Rivers have adapted to these radical transformations and they now contribute to urban regeneration projects by providing an attractive setting for new developments (Marshall 2001, Geoff Petts, Heathcote et al. 2002, Kibel 2007).
et al. 2002, Kibel 2007). This paper will explore how resilience thinking can provide a theoretical framework, to inform the future development of riverside brownfield sites. In view of the increasing risk of destructive flooding there is a need to shift urban design thinking from static and defensive approaches, driven by economy to more dynamic and flexible spatial morphologies that encourage long term robustness, taking into account the unpredictability of water flow.

The first part of this paper will provide a brief overview of the radical changes to urban river corridors in the past thirty years and their characteristics. This will be illustrated by the specific case study of the Don in Sheffield. The second part will attempt to develop an argument to demonstrate how thinking in term of resilience can contribute to the development of key concepts related to urban theory and morphology. The concluding section explores ways of applying principles of resilience thinking to inform the design of urban forms along rivers, taking into account the dynamic and sometimes problematic relationship between rivers and built environment. This study forms part of a PhD concerned with contributing evidence related to the relationship between urban forms, environmental performance and human comfort. The aim of the study is ultimately to inform and guide urban planning and design practice for future urban riverside developments.

Urban Development and Rivers: persistence, adaptability and transformability

The role of rivers in the historic development of a city: The river Don in Sheffield

The urban development of Sheffield is intimately related to its five rivers. The original settlement developed along the river Sheaf, which gave its name to the city. The five valleys between the seven hills created a series of robust green and blue corridors, which still provide very effective links between the city and its surrounding countryside. Sheffield castle was positioned strategically on the hill at the confluence of the river Sheaf and the river Don with a dominant view over the valley towards Doncaster. The river was progressively engineered with dams and weirs to feed water mills and provide land for agricultural activities in the flood plain, as in many other locations in the UK (Rackham 1986). With the development of industry in this part of the city, the land was drained and the river Don canalised. In the 19th century the flood plain was full of industrial premises and one of the most polluted urban environments in the UK. The river itself became an open air sewer and while it was once renowned for its richness in salmon, it became sterile (K.Farnsworth 1987).

Since the 1970s industrial production in Europe and in Sheffield in particular, has diminished and communities have begun to develop a new interest in their lost rivers. In Sheffield a community group called the ‘Five Weir Walk’ was created specifically to put pressure on the council to regain access to the river Don and reclaim the river for leisure
activities such as walking and fishing. After 40 years the ecological qualities of the river have improved dramatically and habitats have progressively remerged to support wildlife and biodiversity (Everard and Moggridge 2012). Oliver Gilbert, an urban ecologist, pointed out that urban rivers have evolved, adapted and repair in a specific way with a mix of native and exotic species referred to as ‘recombinant ecology’ (Gilbert 1998, Rotherham 2011). For example, fig trees grow along the rivers in Sheffield as they benefitted from the heat transferred from the cooling water coming from the industrial premises. Native wood anemones are colonising the dark spaces underneath the Japanese Knotweed, which has partly invaded the riverbanks.

Urban rivers are getting cleaner and visually more pleasing and therefore the old industrial sites in riverside locations have become attractive for urban regeneration. Along the Don new office buildings have been constructed where heavy industries used to be, and the Wicker riverside site is earmarked for mixed use development including housing. However since the dramatic floods of June 2007 during which the Don unexpectedly and very quickly invaded urban spaces in the city centre, developments in the areas along the river have slowed down or stopped completely. The other consequence of the 2007 flood was the drastic clearance of the river channel. One of the major issues related to the flooding was the obstruction of Lady’s bridge by wood debris, so the spontaneous vegetation that had colonised the river edges in the preceding thirty to forty years was removed, destroying a valuable habitat for birds.

This brief overview of the historic evolution of the river Don in Sheffield illustrates the importance of urban river corridors in the past, present and future development of cities. It demonstrates their persistence, adaptability and transformability related to adverse conditions. Their dynamic in space and time and ability to absorb radical changes and regenerate can be a source of inspiration to tackle issues related to climate change and to feed into the thought experiment processes related to urbanism.

**Urban river landscape as a dynamic catalyst in 21st century urbanism**

Rivers are high on the European political and environmental agenda. There is general agreement that in Europe rivers should be cleaned and in some cases restored to their natural condition, with the removal of artificial features such as dams, weirs and artificial banks. The recent dramatic floods in many cities in Europe have highlighted issues related to constructions on flood plains, loss of permeable surfaces and the inadequacy of traditional engineered flood defences. ‘Making space for water’ and ‘water sensitive urban design’ have been put forward as new strategies in contemporary urban planning and design. The project ‘cloudburst’ in Copenhagen initiated after the dramatic floods of 2011 is a good illustration of
this new urban development trend. A wider agenda related to urban rivers is concerned with ‘daylighting’ lost culverted rivers, but this raises complex engineering issues beyond the agenda of this paper.

For old industrial sites earmarked for urban regeneration, a full river restoration including complete removal of water pollution, bringing back natural water flows and course as well as the original ecological habitat, is in most cases inappropriate. The density of population in city centre locations, where these sites are often located, implies a high risk of water contamination linked with sewage overflow. However urban ecologists have demonstrated that an urban river can support high level of biodiversity, rich in species and affordance for nature and people (Gibert 1989). Beyond the potential ecological value of urban rivers, the main asset of these natural elements in cities is to create a more comfortable and enjoyable environment for people to live in, better connected with and adapted to the environmental constraints of our time (Spirn 1998).

Resilience and adaptation: key principles for future riverside developments

Theoretical framework

This study sits within the tradition of the field of urbanism and urban morphology, which developed following the rapid expansion of cities as a consequence of the Industrial Revolution (Choay 1997). It also draws on Lynch and Rodwin’s pioneer work on the development of an analytical framework to link urban form to human needs and comfort. In their article ‘A Theory of Urban Form’, they put forward analytical categories to explore links between forms of urban developments and life values such as health, survival, growth and adaptability (Lynch and Rodwin 1958). Other publications stress the close relationship between urban development and environmental characteristics, including Ian McHarg’s Design with Nature (McHarg 1969) and Hough’s Cities and Natural Processes (Hough 1984). These key publications anticipated the more general shift in built environment theory and practice towards more environmental, social and economical accountability following emergence of the sustainability agenda. Allen and Bryant argue that this shift in urbanism theory falls within the wider trend of critical thinking from ‘linear, binary and reductive paradigm’ characteristics of the 19th and early to mid 20th century to a ‘more nuanced understanding of socio-technological ecology informed by chaos, complexity and information theories (Perelman 2007, Allan and Bryant 2011).

In this context, resilience thinking is put forward as a useful construct in relation to the complexity of issues related to sustainability, building on the idea that cities are not simple static entities but complex dynamic systems (Allan and Bryant 2011, Pickett, Cadenasso et al. 2013). One definition of resilience, which is useful in the context of urbanism, is related to
‘ecological resilience’: ‘the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks’ (Walker, Holling et al. 2004). Walker et al also describe how human design and management can influence resilience through manipulation or enhancing adaptive responses, for example through ‘room to move’ (Walker, Holling et al. 2004). In the field of urban design, Spirn laid out propositions and principles for the design of resilient cities in her seminal book *The Granite Garden: Urban Nature and Human Design* (Spirn 1984). She states that cities are urban ecosystems that are dynamic and interconnected and that urban design is a tool of human adaptation. More generally, Allan and Bryant summarised the key concept and ideas related to resilience, which have had an influence in the field of urbanism. They include robustness, shifting environment, flow and flexibility (Allan and Bryant 2011).

In the specific context of urban rivers and riverside development, protection and resistance rather than adaptability and flexibility have often driven planning, urban strategies and design to address issues related to flood risks (Liao 2012). Consequently, riverside sites in old industrial cities seem ideal experimental grounds in which to explore how to apply resilience thinking to inform urban forms, which are more responsive to environmental, social and economical changes. Geddes used a river valley section to demonstrate the interdependence between cities and their surrounding landscapes, and was a pioneer in considering them as complex and interconnected systems (Geddes 1915). In contemporary planning and design practice, open spaces and rivers in particular are often studied as separate entities, not directly related to the surrounding built environment. In this study we propose considering riverside areas as an integrated whole, arguing that it is necessary to consider the built elements and the spaces in between them, their relationships and their impact on human comfort. For this reason we will refer to urban fabric as encompassing ‘buildings, roads, utilities, open spaces, neighbourhood and natural habitats’ (Walls 1999). This inclusive integrated approach seems to be the only option to respond to the sustainable living agenda. In the specific case of urban riverside it is argued that integrated water management should be the focus of urban design, turning threats of water shortage and flooding into opportunities to create a more sustainable built environment (Watson and Adams 2011). The changes affecting our urban environment are complex and often difficult to predict with certainty, so resilience thinking embracing dynamic and adaptive approaches across temporal and spatial scales seems to be a useful strategy to inform urban design decision making processes and development (Folke 2006).

In order to apply resilience thinking to urban morphology and design guidance, we propose to explore the principles mentioned above through key attributes that we consider important to ensure both environmental and human health. They include scales,
connectivity, diversity, thresholds, comfort and uncertainty, which are commonly used in analytical and design processes related to urban environments and frequently mentioned in urban design literature (Bentley, Alcock et al. 1985). This is not an exhaustive list of elements for study and analysis but these principles provide boundaries and fields of exploration to structure the research.

**Applying Resilience thinking to urban forms in riverside context: theoretical framework**

**Scales / Connectivity**

Urban environments operate at multiple scales, so an interconnected approach is required (Alberti 1999, Allan and Bryant 2011). Urban rivers form a tangible physical link with the surrounding regional landscape. Watersheds of rivers are complex and extend way beyond urban settlements. At the wider regional scale there is a need to create watershed plans to improve water resources and mitigate the threat of extreme weather events. Riverside urban developments have their role to play in these wider strategies, ensuring that they do not add to the problem but alleviate flood risks. The most efficient strategy would be to promote urban forms, which would protect and whenever possible restore the function of the original floodplain(s). This would reduce the risk of a potential cascading effect, pushing the problems of flood risk downstream rather than addressing them all along the water journey. Connectivity is an important concept for ecologists and hydrologists concerned with the integrity of ecosystems and water management. It is also instrumental for designers in relation to human flows (May 2006).

Considerations related to scale of interventions and connectivity between the interventions might also enhance the capacity to adapt to changes. Lister suggests that modular approaches are ‘safe to fail’ because the failure of one component does not necessarily compromised the overall strategy (Lister 2007). Urban morphological approaches to urban analysis and practices provide the structure to consider the different level of resolutions including smaller units such as the plot (Moudon 1997). Considering that level of resolution should provide a greater flexibility to adapt to unpredictable changes. This is advocated by the Plot Base Urbanism Group promoting atomized elements within a broader guiding framework to create resilient places (Porta and Romice 2010).

**Thresholds / transitional edges**

Urban river corridors form transitional edges between a densely built environment and its more natural surroundings. The threshold between the floodable and non-floodable areas is particularly important with regard to the viability of the urban spaces. More flexible and generous transitional spaces along rivers will ensure that the unpredictability of water levels and flows are accommodated. The idea of transitional edge can be associated to the
principle of redundancy put forward in applying resilience thinking (Biggs, Schluter et al. 2015). Alexander stresses the need for a ‘common land’ along the water edge for public use (Alexander, Ishikawa et al. 1977, Biggs, Schluter et al. 2015). This implies exploring various typologies of river edges and adjacent urban forms as well as the transitional spaces between open spaces and buildings. Prominski’s book on River Space Design, focusing on river banks, is a good illustration of the validity of the typomorphological approach, exploring various options and the performance of different design interventions (Prominski, Stockman et al. 2012).

**Diversity**

As discussed above urban areas along rivers have the potential to cater for both human and nonhuman living forms. They support a wide range of ecosystems and habitats but also offer great opportunities for a wide range of activities (May 2006, Everard and Moggridge 2012). The concept of diversity is inherent to thinking in term of resilience by providing a higher capacities to adapt to unpredictable circumstances (Walker and Salt 2006). The built environment surrounding river corridors and engineered flood prevention measures reduce biodiversity with adverse consequences (McKinney 2008, Shochat, 2010). The way forward is to create and manage riverside developments to help the recovery process and encourage biodiversity as well as greater diversity in uses and functions. Mixed uses and variety of buildings will ensure the long term robustness of an urban area with greater flexibility to respond to changes (Bentley, Alcock et al. 1985).

**Uncertainty / temporality**

Despite modern technology and an increased level of accuracy in predicting flood events, none of the recent catastrophic events in major European cities were predicted. Despite flood preventions and defence measures, there remains a permanent uncertainty for local communities in flood plains. The vulnerability to natural and environmental hazards has major consequences on the community well being and the livability of a place (Cutter 2006). The risk factors associated with riverside development need to be factored into the design decision-making process. Engineered approaches to flooding are often quantitative and uncompromising commonly taking the shape of flood defence walls. A softer approach, including more self sufficiency in dealing with exceptional events, will empower the community. The inevitable changes to riverside areas should be fully accommodated in urban spaces rather than prevented.
Comfort / well being

These attributes focus on people and their experience of the urban environment. Climate change and the urban heat island effect will have major consequences on our experience of cities and our comfort in living in them. Rivers have proven to be effective in cooling adjacent urban sites (Hathway and Sharples 2012). This potential needs to be explored further to inform urban forms and building orientations to maximise the positive impact of the river. Riverside locations possess qualitative value and manifest a particular affinity and comfort through contact with water. Water raises people imagination and creates unique urban environments with a strong sense of identity. It provides an opportunity to escape both visually and physically from dense urban areas, and dream instead of other places (Bachelard 1942).

Conclusion

The spatial and temporal dynamic of rivers can be a source of inspiration to consider issues related to strategic urban planning. Urbanism in general and more specifically the regeneration of urban riverside brownfield sites in old industrial cities is a complex process requiring multidisciplinary analysis. Applying resilience thinking to inform urban design guidance should provide an effective theoretical framework to create links between different disciplines concerned with the urban fabric, and working towards better places to live. It seems also appropriate in relation to the need for riverside sites to deal with unexpected changes and flood events (Liao 2012).

This paper identifies key underpinning principles to be used as part of the research evaluation and recommendation process. They will contribute to the evaluation and development of urban planning and design strategies for urban riverside developments. They will provide a robust, consistent and coherent structure for the case study analysis, enabling the compilation of comparative data. They will also provide fields of exploration and boundaries to fulfill the aim of the research which is to inform the decision making processes to create more responsive environments, places where opportunities and a degree of choice are maximized.

The theoretical framework explored in this paper proposes moving away from singular generic proposals towards more relative and diverse options. Design guidance informed by resilient thinking should be responsive and open ended to provide structure and order without preventing improvisation and imagination. In order to maximise the flexibility and adaptability value of the proposed framework, it should be slow and long term rather than fast and short term. These overall principles seem highly appropriate in the urban river context, as they follow the less threatening rhythm of flowing water.
References


ABSTRACT Designed to inform energy bill of each residential neighbourhood in South Korea, an Apartment Management Information System (AMIS) was introduced. We analyse the AMIS datasets across 8 cities and City of Seoul was identified as the highest increased energy use city for summer (August) cooling over the annual average use with 48.52% while City of Gwangju was the lowest with 28.74%. Likewise, 25 city districts were examined in City of Seoul and it showed that the Gangnam district had the highest increase rate (67.66%) while the Gwanak district had the lowest (27.85%). The increase rate (IR) in this paper is the term to present increased energy use for summer cooling over annual average energy use. Within Gangnam, 103 neighbourhoods were investigated to identify two neighbourhood sites as case study for the highest and lowest increased energy use neighbourhoods for summer cooling: 111.85% and 40.40% respectively. Moreover, based on the findings from the increased energy use in Gangnam, energy use clusters were classified and it was found that the increased energy use had correlation with the floor area per apartment, the property price per m² and the elevation of the apartment neighbourhood. To further identify key parameters of urban microclimate which affected the increased energy use for summer cooling, a microclimate change simulation framework was proposed. The findings through the computational microclimate modelling imply that high temperature during the night-time may result in increased energy consumption: the range of potential air temperature in 2014 was predicted to 24.4°C - 26.6°C in the lowest energy use neighbourhood and 27.0°C - 32.4°C in the highest energy use neighbourhood at 5am (peak gap temperature hour). Moreover, the potential impacts of climate change on the case study sites were predicted to have an increase air temperature of 2.4°C in the lowest energy use neighbourhood and 2.3°C in the highest at 5am in 2050 from current (2014) in city of Seoul.

KEYWORDS: Urban microclimate change modelling; environmental simulation; building energy use cluster; apartment management information system; site-specific climate change adaptation design; city district of Seoul.
Introduction

How will the impact of climate change on high-rise residential neighbourhoods look like in City of Seoul, South Korea and how to deploy effective passive environmental design strategies resilient to climate change? In order to best approach adaptation design, we need to know the likely impacts of climate change on buildings in their specific locations taking into account the changing local urban and environmental conditions overtime. In densely built-up urban areas, such as City of Seoul, the effects of urban heat island (UHI) can be potentially exacerbated during hot days due to the warming climate and the regional warming weather conditions may have significant impacts on building thermal and energy performance (Wilde and Coley, 2012). Quantitatively, Crawley (2008) predicted the impact of global warming on building energy performance: the overall energy use on built environment is predicted to increase by more than 20% from current condition in ‘tropical’ climates, and reduction of 25% energy use for heating and increase of 15% for cooling in temperate and mid-latitude climates.

In response to the changing environmental conditions, we set out to investigate how the environmental performance of existing high-rise residential apartment neighbourhoods and the buildings may be assessed under the climate change scenarios projected for the City of Seoul. This combined urban microclimate modelling and building energy performance simulation will then inform what site-specific passive environmental design strategies and features (both outdoor and indoor) can be developed for adapting the neighbourhoods and buildings in Seoul. Our hypothesis is threefold: (1) that certain aspects (parameters) of the urban microclimate in high-rise residential neighbourhoods are correlated to energy use in summer cooling, (2) that identification of the key parameters of microclimate will point to specific areas for developing site-specific climate change adaptation design strategies in response to climate change projective simulations, and (3) that this site-specific adaptation design approach will be effective in shaping and deploying passive features that aim to reduce energy use for summer cooling in future years.

This paper reports on our current microclimate change simulation of two urban residential neighbourhood sites that present the highest and lowest increase of energy use for summer cooling in City of Seoul. We postulate that these two urban neighbourhood sites present contrasting microclimate conditions that may have affected different energy uses in summer cooling. If found, the correlations between urban microclimate modelling results and energy use data analysis will provide an environmental basis for developing city-district-specific climate change adaptation design strategies and features that cannot be achieved previously.
Methods

A Microclimate Change Simulation Framework

An urban microclimate change simulation framework to predict the likely impact of climate change on urban neighbourhoods from city to urban neighbourhood level is proposed, taking into account current projections of climate change. Firstly, a local climate change condition at a city level is generated by using a current climate change projection, CCWorldWeatherGen with HadCM3 A2 Scenario: UK Met Office Hadley Centre general circulation model predictions for ‘medium-high’ emissions (Met Office, 2014). Secondly, based on the extracted climate change condition, a site-specific microclimate change condition at urban neighbourhood level is simulated by Envi-met Version 4 (2015).

Apartment Management Information System (AMIS)

According to the latest statistical report from the Korean Statistical Information Service, about 58% over the total number of residential buildings in South Korea are apartments of which around 84% are tall buildings over 10-story high (KOSIS, 2014). Moreover, residential sector is responsible for about 9.1% of the total greenhouse gas emissions: it represents that about 5.4% of national emissions is caused by apartment arithmetically (Oh et al, 2010). Due to the distinct feature of high-rise residential urban neighbourhoods in South Korea, the central government of Ministry of Land, Infrastructure and Transport (MoLIT) established the AMIS to inform the energy bill of each apartment neighbourhood and to contribute to reduction of energy consumption and mitigation of greenhouse gas emissions (AMIS, 2013).

Of all the energy use datasets, an electricity bill for August, the hottest month of the year, is used to identify sites for case study as the impact of climate change and urban heat island intensity on building energy consumption is directly related to electricity use for mechanical chiller during the summer period. However, the electricity billing includes operating costs for not only mechanical chiller but also other home appliances, hence the need for increase rate (IR) of August electricity bill over annual electricity bill, is calculated by following equation: IR (%) = (electricity for August – annual average electricity) / annual average electricity x 100

Study Area

By analysing the AMIS datasets across 8 cities in South Korea from 2010 to 2013, we have identified that City of Seoul presents the highest IR (48.52%) of electricity consumption for summer cooling while City of Gwangju presents the lowest IR (28.74%).

Also, based on the IR analysis of the AMIS in City of Seoul 2010-2013, 25 city districts have been examined to identify the city district presenting the highest IR. It is found that the city district of Gangnam has the highest IR (67.66%) while Gwanak has the lowest IR.
We are interested in identifying the underlying causes of such variation. In particular, we set out investigating the urban microclimate conditions of the high-rise residential apartment neighbourhoods where the highest IR and lowest IR occur.

**Sites Identification for Case Studies**

The highest and lowest IR apartment neighbourhoods (ANs) for case studies are identified in Gangnam City District (CD), using IR analysis of the AMIS. There are 174 ANs in Gangnam CD registered in AMIS in 2013 and the registration rate is 96%. However, some special types of apartments, such as social housings and studio types were excluded in order to minimize systematic errors resulted from social and economic aspects in assessment of energy use. In the end, a total of 103 ANs were investigated.

**Energy Use Clusters (EUCs)**

Based on the IR of each AN in Gangnam CD, energy use clusters (EUCs) were classified. Figure 1 shows the three EUCs in Gangnam: high, middle and low.

![Fig. 1. Energy use clusters in Gangnam city district and locations of the highest and lowest IR ANs.](image)
The highest and lowest IR ANs in Gangnam

Based on the visualized EUCs in Gangnam, the highest and lowest IR ANs were identified within high and low ECUs. Table 1 describes details of the identified sites.

<table>
<thead>
<tr>
<th>IR (%)</th>
<th>NoB</th>
<th>NoA</th>
<th>TFA(m²)</th>
<th>TSA(m²)</th>
<th>FAR</th>
<th>FA/A (m²)</th>
<th>TS</th>
<th>BY</th>
<th>P(£)/m²</th>
<th>Elev (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest IR AN</td>
<td>40.40</td>
<td>11</td>
<td>930</td>
<td>87391</td>
<td>34739</td>
<td>2.52</td>
<td>93.97</td>
<td>15</td>
<td>1994</td>
<td>3,674</td>
</tr>
<tr>
<td>Highest IR AN</td>
<td>111.85</td>
<td>9</td>
<td>911</td>
<td>128756</td>
<td>45002</td>
<td>2.86</td>
<td>141.33</td>
<td>17</td>
<td>1987</td>
<td>5,242</td>
</tr>
</tbody>
</table>

Table 1. Details of the two identified sites for case study: NoB (number of buildings), NoA (number of apartments), TFA (total floor area), TSA (total site area), FAR (floor area ratio to site), FA/A (Floor area per apartment), TS (top story), BY (built year), p(£)/m² (property price per m²) and Elev (located elevation).

Bivariate Correlation Analysis

In order to identify the key parameters of urban neighbourhood that may affect microclimate conditions and building energy consumptions for summer cooling, a bivariate correlation analysis was conducted. Table 2 shows the correlation coefficient (r) and the interpretation of the effect size from Cohen’s (1992).

<table>
<thead>
<tr>
<th>r</th>
<th>NoB</th>
<th>NoA</th>
<th>TFA</th>
<th>TSA</th>
<th>FAR</th>
<th>FA/A (m²)</th>
<th>TS</th>
<th>BY</th>
<th>P(£)/m²</th>
<th>Elev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>moderate</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
</tr>
</tbody>
</table>

Table 2. Correlation coefficient (r) in 103 ANs IR data and the interpretation.

There is no clear relationship between IR and the parameters although the coefficient value of FA/A, P(£)/m² and Elev are relatively higher than the others. We conducted the bivariate correlation analysis in 38 ANs in EUCs (Table 3). The coefficient value of above three parameters was increased to ‘strong’ and ‘moderate’. It suggested that increased energy consumption in summer cooling has stronger correlation with FA/A, P(£)/m² and Elev.

<table>
<thead>
<tr>
<th>r</th>
<th>NoB</th>
<th>NoA</th>
<th>TFA</th>
<th>TSA</th>
<th>FAR</th>
<th>FA/A (m²)</th>
<th>TS</th>
<th>BY</th>
<th>P(£)/m²</th>
<th>Elev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>strong</td>
<td>weak</td>
<td>weak</td>
<td>moderate</td>
<td>moderate</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Correlation coefficient (r) in 38 ANs IR data within EUCs and the interpretation.
**Envi-met model calibration**

To evaluate the proposed microclimate simulation framework, we carried out a local weather station neighbourhood case study using historically monitored weather datasets, including air temperature, relative humidity, wind speed and wind direction on 1st of August 2014, the hottest day of the year. The model domain size is 130x130x30 and the grid resolution (1.5mx1.5mx2m). Table 4 shows key input parameters for Envi-met simulation.

<table>
<thead>
<tr>
<th>Metrological Inputs</th>
<th>Air Temperature (°C)</th>
<th>29.35</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative Humidity (%)</td>
<td>65.96</td>
</tr>
<tr>
<td></td>
<td>Wind Direction (°)</td>
<td>72.21</td>
</tr>
<tr>
<td></td>
<td>Wind Speed (m/s)</td>
<td>1.828</td>
</tr>
<tr>
<td></td>
<td>Specific Humidity (g/kg)</td>
<td>7.412</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground</th>
<th>Roughness Length (m)</th>
<th>0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Road</td>
<td>Default value</td>
<td></td>
</tr>
<tr>
<td>Concrete Pavement Grey</td>
<td>Default value</td>
<td></td>
</tr>
<tr>
<td>Loamy Soil</td>
<td>Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plants</th>
<th>3D tree, Cypress</th>
<th>Height (6m), Crown width (3m), LAD=2m²/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1D, grass</td>
<td>Height (0.1m), LAD=0.3m²/m³</td>
<td></td>
</tr>
</tbody>
</table>

| Building            | Concrete wall and roof | Default value |

Table 4. Major input parameters for Envi-met simulation.

**Results**

Linear regression analysis between Envi-met simulated outputs and field measurement data was carried out to evaluate model reliability. However, due to the systematic error of Envi-met model for wind flows (Kruger et al, 2011; Yang et al, 2013), the evaluation study was conducted in air temperature and relative humidity.

<table>
<thead>
<tr>
<th></th>
<th>( r )</th>
<th>( r^2 )</th>
<th>( N )</th>
<th>RMSE ( \text{°C} )</th>
<th>Mean (monitored / simulated data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>0.968</td>
<td>0.938</td>
<td>24</td>
<td>1.62</td>
<td>29.58 / 29.27 (°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>0.958</td>
<td>0.919</td>
<td>24</td>
<td>9.14(%)</td>
<td>65.21 / 60.09 (%)</td>
</tr>
</tbody>
</table>

Table 5. Quantitative evaluation of hourly Envi-met model outputs in Gangnam CD weather station in 1st August 2014: \( r \) (correlation coefficient), \( r^2 \) (coefficient determination), \( N \) (number of variation) and RMSE (root mean spare error).

Table 5 presents that both simulation outputs are strongly correlated with monitored data. The effect size of coefficient value \( r \) shows ‘very strong’ (0.9<\( r \)<1.0) in both cases. Moreover, the correlation coefficient \( r^2 \) is 0.938 for temperature and 0.919 for relative humidity respectively. Given the result of our Gangnam weather station study, the simulation framework seems to be reasonably calibrated to be applied to climate change impact on the highest and lowest IR neighbourhood study.
Climate Change Impact on Case Study Sites

On the basis of evaluated microclimate simulation framework, we applied it into the highest and lowest IR ANs to predict climate change impact on high-rise residential apartment neighbourhoods. Table 6 shows predicted hourly air temperature (°C) of current (2014) and future (2050) at 1.5m from ground level in the highest and lowest IR ANs.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>01</td>
<td>26.9</td>
<td>28.6</td>
<td>28.9</td>
<td>30.5</td>
<td>09</td>
<td>28.0</td>
<td>29.4</td>
<td>31.0</td>
<td>32.1</td>
<td>17</td>
<td>32.0</td>
<td>31.0</td>
</tr>
<tr>
<td>02</td>
<td>26.5</td>
<td>29.3</td>
<td>28.6</td>
<td>31.3</td>
<td>10</td>
<td>29.1</td>
<td>29.3</td>
<td>31.9</td>
<td>32.0</td>
<td>18</td>
<td>31.6</td>
<td>30.9</td>
</tr>
<tr>
<td>03</td>
<td>26.2</td>
<td>30.1</td>
<td>28.4</td>
<td>32.2</td>
<td>11</td>
<td>30.1</td>
<td>29.5</td>
<td>32.8</td>
<td>32.1</td>
<td>19</td>
<td>31.1</td>
<td>30.8</td>
</tr>
<tr>
<td>04</td>
<td>26.0</td>
<td>30.4</td>
<td>28.2</td>
<td>32.6</td>
<td>12</td>
<td>30.9</td>
<td>29.9</td>
<td>33.9</td>
<td>32.6</td>
<td>20</td>
<td>30.8</td>
<td>30.6</td>
</tr>
<tr>
<td>05</td>
<td>25.8</td>
<td>30.5</td>
<td>28.2</td>
<td>32.8</td>
<td>13</td>
<td>32.1</td>
<td>30.5</td>
<td>34.1</td>
<td>32.7</td>
<td>21</td>
<td>30.3</td>
<td>30.2</td>
</tr>
<tr>
<td>06</td>
<td>25.7</td>
<td>30.4</td>
<td>28.3</td>
<td>32.8</td>
<td>14</td>
<td>32.3</td>
<td>30.7</td>
<td>34.1</td>
<td>32.7</td>
<td>22</td>
<td>30.0</td>
<td>30.1</td>
</tr>
<tr>
<td>07</td>
<td>26.0</td>
<td>30.3</td>
<td>28.7</td>
<td>32.8</td>
<td>15</td>
<td>32.3</td>
<td>30.8</td>
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<td>08</td>
<td>26.7</td>
<td>29.6</td>
<td>29.9</td>
<td>32.4</td>
<td>16</td>
<td>32.4</td>
<td>31.0</td>
<td>34.2</td>
<td>32.8</td>
<td>24</td>
<td>28.0</td>
<td>30.2</td>
</tr>
</tbody>
</table>

Table 6. Comparison of predicted hourly air temperature (°C) between the lowest and highest IR ANs from 01:00 to 24:00 in 1st of August, 2014 and 2050: L (lowest IR AN) and H (highest IR AN).

It shows that the predicted night-time air temperatures of the highest IR AN in both 2014 and 2050 are much higher than the lowest while its day-time temperatures are opposite to the night: average gaps between them from 1am to 8am in 2014 and 2050 are 3.7°C and 3.5°C respectively. It implies that high temperature of night-time may affect high energy use for summer cooling in residential urban neighbourhoods.

Figure 2 and 3 illustrate predicted air temperature and relative humidity of case study areas in 2014 and 2050 at 5am when the temperature difference is the widest. Here, the overall visual comparison between the lowest and highest IR ANs in 2014 shows that the range of potential air temperature is significantly dynamic from 24.4°C to 32.4°C at 5am due to the different urban configuration (Fig. 2 (A) and (B)). Moreover, the future air temperature range in 2050 was predicted to have an increase of 26.7°C - 34.6°C owing to the projected climate change scenario (Fig. 2 (C) and (D)). This implies that the high temperature during the night-time may result in increased energy consumption for summer cooling.
Fig. 2. Envi-met potential air temperature of the highest and lowest IR ANs in 2014 and 2050 at 5am (1.5m from ground level): A (Lowest2014), B (Highest2014), C (Lowest2050) and D (Highest2050).

Fig. 3. Envi-met potential relative humidity of the highest and lowest IR ANs in 2014 and 2050 at 5am (1.5m from ground level): A (Lowest2014), B (Highest2014), C (Lowest2050) and D (Highest2050).
Conclusion

Firstly, by analysing an open energy use datasets of AMIS across 8 cities in South Korea, 25 city districts in City of Seoul and 174 apartment neighbourhoods in Gangnam CD from 2010 to 2013, two sites for case study were identified as the highest and lowest increased energy use ANs for summer (August) cooling. In detail, it showed that City of Seoul presented the highest increase (48.52%) over the annual average use and City of Gwangju was the lowest (28.74%). In City of Seoul, Gangnam CD had the highest increase rate (67.66%) while Gwanak CD was the lowest (27.85%). Finally, the highest and lowest energy use ANs for summer cooling were identified with 111.85% and 40.40% respectively. Moreover, based on the IR datasets, energy use clusters were classified, implying that there were certain aspects were correlated to energy use in summer cooling. A correlation analysis was conducted between IR and social and physical information collected from AMIS. The correlation analysis suggested that increased energy consumption in summer cooling had correlation with the floor area per apartment, the property price per m² and located elevation.

Secondly, a microclimate change simulation framework was proposed to inform climate change impacts on the identified existing apartment neighbourhoods (the highest and lowest IR ANs) in City of Seoul. From the distribution of predicted hourly air temperature, we assumed that high temperature during the night-time may result in high energy use in summer cooling.

Finally, we intend to carry out further simulation studies into other ANs in Gangnam CD to confirm the relationship between high temperature of night-time and the energy use for summer cooling. The implication of the correlation will then identify physical key parameters which affect high temperature at night for effective site-specific adaptation design.
References


The Social and Spatial Transformative Impact of an Urban Cable-Car: The case of Medellin

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ABSTRACT: In Latin America, informal settlements are fast becoming a recognised part of the city, increasing international awareness of urban poverty and segregated communities. This has led to the rapid rise of spatial interventions of which urban cable-car transportation is one of the most popular, these aim to address the physical causes of segregation such as steep slopes and poor road network by providing a vastly improved form of mobility. Politically, their low cost, relatively quick construction, minimum disruption to existing homes and low emission levels, makes them very appealing to municipalities. However, as Peter Brand says “it would be illogical to suppose that aerial cable-car projects such as the Metrocables in Medellin will provoke, in and of themselves, broader processes of urban improvement” (Brand, 2013).

So how can we better interpret the social and spatial gains improved integration offers and does this make slum upgrades more resilient?

Through the case of Medellin, this paper explores how improved spatial connectivity (provided by urban cable-cars) affects local movement patterns, which consequently affects local commercial patterns, allowing for a discussion on how formal and informal commerce respond to its reconfiguration of the urban grid. Using a space syntax methodology, the cable-cars in Medellin are analysed to determine spatial integration levels and then correlated to local movement patterns to guarantee accuracy. After this spatial analysis, local socioeconomic data, which specifically focuses on commercial activities (both formal and informal) are recorded onsite and analysed. Then both the spatial analysis and local socioeconomic data are cross-referenced, with the correlations between the two discussed. This allows the impact of spatially reconfiguring an urban grid using a cable-car to be related to local commercial activities and movement patterns.

KEY WORDS: Urban cable-car; spatial connectivity; space syntax; slum upgrading; spatial analysis.

The Era of Urban Cable-cars, and ‘Social Urbanism’

Whilst, cable-cars have their ‘origins in aerial lifts that have been used for decades in Alpine ski resorts’, they have been previously used in urban transport (Alshalalfah et al., 2012). In New York there has been a cable-tram to Roosevelt Island since 1976 and similarly cable-cars has been used in Singapore since 1974 to cross the Keppel Harbour. There are varies other examples that have been used to combat obstacles in the city, mostly
for tourists, making it hard to clearly determine its first use as a transport system, but Medellin was the first to use them to connect to areas of poverty.

Medellin is the second largest city in Colombia with a metropolitan population of around 3,500,000 and until recently was more famous for extreme violence and drug cartels, once being named the most deadly city in the world (Calderon, 2008). However, since these dark days, a new type of city has emerged, encapsulated by innovative urbanism and eye-catching architecture, with the bold ambition of alleviating the urban poor out of poverty (Davila, 2013). A lot of this is credited to Sergio Fajardo, who was elected mayor in 2004, under the promise of creating an ‘equal city for all’ and ‘repaying an historic debt’ to the poorest neighbourhoods. This developed into a new approach for implementing urban projects, which ‘had the objective that whenever there is a physical transformation of development, in parallel there are social programs reinforcing the change’ (Davila, 2013). To do this the metaphor ‘Social Urbanism’ was used, this is ‘an integrated approach to transport and urban development, and for the power of the strategic potential of this integrated approach to address urban inequality’ (Levy, 2013).

The city’s transformation is often symbolized by the urban cable-car transport system. Yet the cable-car was not introduced by Fajardo, but instead it was conceived and implemented separately by the previous mayor Luis Perez.

The first cable-car line in Medellin was built in 2004, connecting isolated hillside slums in the northeast with the existing north-south overground metro line. Whilst it is questionable how socially driven the concept of the first cable-car in Medellin was, ‘since when it was launched in 2004, the main objective was to improve access of the residents of those sectors to the main metro system, while simultaneously taking advantage of the under-used capacity of the city’s overground metro’ (Brand, 2013). Once installed the municipality ‘became aware of the potential as a reference point for broader and more comprehensive urban interventions’ (ibid). This saw the start of the Integral Urban Project, (‘Proyecto Urbano Integral’ – PUI), which had the objective to increase the quality of life of inhabitants, focusing on areas where poverty and violence are visible. This can be best observed in PUI Noriental next to the first cable-car line and was the pilot project. This oversaw the construction of community facilities, like the Library-Park Santo Domingo and the Center for Business Development of the District (CEDEZO), 15 new or upgraded public spaces and streets, 3 new bridges offering connections between local neighbourhoods, new housing including the upgrading and consolidation of existing homes, a wide range of community meetings, workshops and events, a series of social programs from the municipality (Calderon, 2008). All of which are visibly located nearby the cable-car, creating a direct
connection. This led to a widely praised transformation of one the most violent and poor
neighbourhoods in Medellin, with the cable-car being at the heart of this change.

![Fig. 1. The redevelopment of the area surrounding Santo Domingo Metrocable station. Image from http://informalsettlements.blogspot.co.uk/](image)

The success of the first line led to a second line being built in 2007 in the west of the city, which again provided transport to the main overground metro system for people in isolated hillside neighbourhoods. Yet, unlike the first line, the neighbourhood here are less populated and in the case of the terminal station, not fully built, which has led to the line being underused, whereas the first line runs at near full usage capacity most days, with long queues during rush-hour. Technically both cable-car systems have the same usage capacity – each cabin has a capacity of ten people. Currently two more lines are being built in the east of the city, connecting to a new tram and another line is proposed for the northwest of the city. The success of Medellin, especially the first cable-car, led to the replications of a cable-car transport system in other cities across Latin America, most notably Caracas and Rio de Janeiro. Similarly, these targeted areas of poverty, where the built environment is too dense and complex for any other form of transport to function without huge alterations to the urban fabric and likewise they connect to the main transport system. These also aimed to consolidate the cable-cars and help transform the surrounding neighbourhood with supporting social and spatial interventions.

Governments and municipalities often see the cable-car as a political tool to increase popularity and state presence in areas of poverty, due to its relatively cheap cost and ease of construction, but as Brand stats *‘an aerial cable-car that hangs over an unchangingly*
improvised social and urban landscape loses all charm and positive political significance’ (Brand, 2013a). Therefore supporting projects become very important. With the first line in Medellin ‘in the four years following its introduction, the city invested seven times the cost of the cable-car system in complementary urban projects’, harnessing its potential to not only spatial reconnect the poor, but also to socially and economically alleviate poor communities (Davila, 2013). Whilst these projects have the potential to socially empower residents, without the spatial connection to the rest of the city, there is also the potential that these projects could become introvert and isolated within each community. With the second line these supporting projects are not as heavily used or as visible and the terminal station ‘La Aurora’ is an area allocated for densification by the municipality, where currently a large numbers of social housing blocks are being built. This suggests that the second cable-car was used to relocate a large numbers of people and ‘leap-frog the neighbourhoods closer to the Metro station in a bid connect as efficiently as possible to this newly developed are’, instead of connecting existing isolated areas, as with the first line (Brand, 2013).

Cable-cars float over buildings, preventing the need to demolish homes or for time consuming journeys on buses and have low construction costs, a short build time and are environmental friendly, making them very appealing, but, it is their role in the upgrading process that is often of most interest.

Spatial Configuration, Spatial Network

Since the emergence of the term ‘informal’ in the ‘early 1970s to describe a set of socioeconomic and spatial processes, which combined irregularity with very low levels of productivity in the product of goods, services, and the built environment’ its relationship to spatial configuration of cities has gained enormous importance, especially the spatial relationship between the local and global (Fiori, 2014). Bill Hillier discusses this as a type of duality in his paper ‘A theory of the city as object’, where he explains ‘a local process generates differences in local grid patterns and apparently reflects differences in spatial culture; and the other a global process generates a single overriding structure that seems to reflect a more generic or universal process’. Whilst, Hillier is not directly referencing an informal settlement, he highlights how local socio-components create the underlying pattern of differences and how a set of ‘autonomous spatial laws are governing the affects on spatial configuration’ and it is these ‘invariants’ that allow for greater spatial integration (Hillier, 2002). This can be connected to the duality of the ‘binary debate’ between the informal and formal city and how ‘the question of simultaneity and coexistence need increasing attention from the perspective of new challenges in the design and constant redesign of cities’ (Hernandez, 2010).
Hillier’s method of understanding the city through spatial qualities can be understood as Space Syntax, a method that computationally quantifies spatial configurations, providing a framework to assess and predict urban systems. Space Syntax has an established connection to urban theory that ‘links physical aspects of the urban system with its functional, social and behavioural aspects’ (Karimi, 2013). Part of this has focused on urban segregation, theorising how societal conditions can be linked to spatial isolation. Laura Vaughan discusses how ‘life in a poor neighbourhood is different from one in mixed-income neighbourhood and it is vital to consider this difference in order to understand everyday constraints on integration, such as access to work or the mixing of population’. This shows the importance of connecting conditions in society with space, ‘the reason this matters is that the way in which urban spaces both acquire social meaning and have social consequences comes out of how they form part of the city’s layout’ (Vaughan and Arbaci, 2011).

Space Syntax has become a powerful tool in recent times to understand spatial problems and aid designers, however questions remain about its flexibility to work in complex and dynamic urban environments, where space and society are constantly changing. Typical, Space Syntax measures connectivity against metric or angular measurements to determine integration, this simply homogenizes space as a two-dimensional entity, not taking into others forms of connectivity, such as topology and transport. This was addressed by Stephen Law et al in the paper ‘Towards a Multi-modal Space Syntax Analysis. A case study of the London street and underground network’. This explores a method to understand how different spatial networks impact today’s society through the example of London’s underground (Law et al., 2012). This demonstrates the possibility to adapt a spatial model to take into account the varying forms of spatial connectivity offered from public transport, but does not account for varying times of the day, which affect travel times or local economic restrictions, which stop people using the underground.

When it is used at a local scale or with a specific user type, Space Syntax often needs adapting to take into account local variables, however as a method to measure the spatial network of a city, it provide a very accurate image of the city’s spatial connections.

Objectives

The main objective of this paper is to develop an understanding of the relationship between the spatial and socioeconomic impacts that has resulted from urban cable-cars in Medellin. Therefore this paper aims to first demonstrate the spatial impact of the two varying cable-car lines, though spatial analysis of the city and then connect these findings to local processes and conditions surrounding the cable-car stations. To do this two local cases in
Medellin have been studied – San Javier and Santo Domingo – both represent different types of urban environments and different cable-car line (Fig. 2 & 3).

Fig. 2. Map of Medellin and case studies. The red lines indicate the main transport system. The first case Santo Domingo is situated high up the valley, in a dense area of informality. The second case San Javier is located to the west on flat land, in a mainly formal neighbourhood.

Fig. 3. Plan of each case study. Santo Domingo (left) and San Javier (right).

Methodology
This paper uses an evidence-based methodology to collect the main spatial data, allowing it to be sourced independently and remain unbiased. This method simply records what is seen onsite at different times of the day and measures spatial connections via an unweighted spatial model (no other variable used other than space).
The first part uses a standard Space Syntax model to spatially analyse the metropolitan area and visualise the impact of the cable-car. Creating two different models, the first with just streets and second with the cable-car lines, and then comparing the two did this. This used two typical ‘Space Syntax’ measurements, ‘Choice’ and ‘Integration’ (Fig. 4). ‘Choice’ demonstrates the most important ‘through’ spaces, these are principally movement route and ‘Integration’ demonstrates ‘to’ spaces, these are typically urban centres. These are then calculated at different local scales, to determine different levels of impact. At this stage it is already clear that this method neglects time-based influences like the rapid connectivity of transport and steep topologies, however for the purpose of developing accurate results, this paper concentrated on using established measurements.

Fig. 4. Two Space Syntax measurements explained: “(a) A notional grid with a horizontal main street, vertical cross street, side streets and back streets. (b) Notional grid: pattern of ‘integration’ values – or the closeness of each line to all others – from dark for highest through to light for least. (c) Notional grid: pattern of ‘choice’ values, or the degree to which each line lies on simplest paths from each line to all others, from dark for highest through to light for least.” Images and explanations from ‘The Space Syntax of Urban Segregation’ (Vaughan, 2007).

After the spatial analysis, the paper focused on onsite observations, this aims to explicitly and un-biasedly record movement, user type and commerce surrounding each case, by simply recording what is seen at different times of the day. This firstly involved ‘static snapshots’, which is completed by marking and categorising the different types of pedestrians surrounding each case at two different times of the day (morning and afternoon). Pedestrians are mainly categorised by age and gender, this aims to differentiate the typical working age groups – kids (anyone under 16), youths (male or female between 16-24) and working adults (male or female between 24-65). In addition there are categorises for people with a disability and tourists, for nonstandard users, and furthermore there is a category for street vendors/sellers to record street commerce. This was followed by movement observations, which counted the total number of people passing a imaginary line or zone on the street, at five minute intervals (multiplied by 12 to get hourly averages) and at
3 different times of the day (8am-10am, 12pm-2pm and 4pm-6pm). The counting zones are chosen to be in close vicinity to the station, to pickup the movement patterns influenced by the transport and the times are chosen to pickup different types of foot traffic, such as mid-morning, lunchtime and afternoon rush-hour. Finally land-use surveys highlight entertainment (bars, restaurants, cafes, bakeries, gambling facilities and billiards halls), the main municipal services (police station, hospital and schools) and interventions. Entertainment land-uses are used since they cover the largest variety of land-uses used by Colombians to socialise and provides a type of land-use that is uninfluenced by the municipality, in the terms of location.

This methodology aimed to create an unbiased and independently sourced dataset, by explicitly recording movement patterns, user types and commercial, from onsite observations, which can then be correlated and cross-referenced to develop an understanding of the relationship between the spatial and local socioeconomic condition.

**Spatial Analysis Results**

The analysis demonstrated clear spatial impact from the cable-car, when comparing the spatial model ‘with’ the cable-cars lines and ‘without’, however the level of impact differs between the first and second cable-car lines, this is best observed from the ‘integration’ calculations (Fig. 5). In the areas surrounding the first cable-car line there is an obvious visible impact, which increases steadily as the calculated local scale increases, whereas with the second cable-car line the impact is less obvious with no impact being noticeable until local scale 4500m. This varying impact can be associated with the urban grid, as around the first cable-car line there is a very compact grid with badly connected streets, so the introduction of a new direct connection has the instant impact of improving integration. Whereas the second line passes less dense areas that have not yet consolidated, thus the introduction of a new connection has less affect by connecting fewer people. When the impact is looked at more closely, the overall journey offered by the first line simplifies the trip with a direct straight line over a very complex and compact urban grid that is badly connected to direct roads into the city. So, whilst the cable-car provides a very slow form of transport, when compared to the required routes used by buses, which are also constantly influenced by the traffic, the cable-car provides a more reliable form of integration. Whereas in San Javier the grid already has good connections with the existing urban network, thus the extra connection does not have much impact locally and the rest of the second line is less dense and complex, due to its openness and unconsolidated urban fabric, allowing these neighbourhoods quicker connections to well connected roads.

These changes are observed from the ‘integration’ calculations, because the ‘choice’ calculation shows little visual impact. Yet, whilst there is no obvious change, ‘choice’ still
successfully demonstrates the most important ‘through’ spaces, which are positioned next to the two observed stations.

Fig. 5. Spatial Model Results. ‘Choice’ (left) and ‘Integration’ (right). Bubbled areas indicated the two cable-car lines.

These results show there is a clear spatial integration impact in Santo Domingo and the area surrounding the first line, related to the cable-car improving the poorly connected existing urban grid, making it simpler to connect to the rest of the city. Whereas with the second line the impact is more subdued, due to its sparsely organised neighbourhoods and San Javier’s formal street layout. In both cases the spatial analysis has demonstrated that the most important existing ‘through’ spaces are well positioned next to the new cable-car line, demonstrating the importance of the existing urban grid when planning a new cable-car connection.

Onsite Results

After the spatial analysis the research looked at onsite observations, focusing on movement patterns, static snapshots and land-uses.

In San Javier, the movement patterns showed Carrera (Cr) 99, which is perpendicular to the station as the most popular for movement, peaking between 12pm and 2pm during a
weekday (school lunchtime). The vast majority of movement went up and down this road, with the busiest point being between the exit of the station and microbus pickup zone. The majority of side streets are quiet, only getting busier during the afternoon rush hour between 4pm-6pm. This pattern is generally the same at Santo Domingo, where the majority of people move northwards up Cr31 or Cr32, towards the microbuses and a large number also moved south on Cr31 during afternoon rush hour, where microbuses stop. Here Saturday evening between 4pm and 6pm sees the largest movement of people. However, in Santo Domingo, there is a larger directional variation, as unlike San Javier movement is not mainly linear and changes throughout the day, with important junctions showing a high level of activity and directional variation (Fig. 6).

Fig. 6. Movement Patterns. Santo Domingo (left) and San Javier (right). The red areas show the movement flows and the arrows indicate people numbers – ranging from 0 to 250 (people per hour) for dark blue and 1500 to 2000 for red.

The ‘static snapshots’ reinforce the importance of Cr99 in San Javier, as both morning and evening snapshots showed the majority of people gathering here. The largest group in the morning was women between 25-65 at 38.2% and in the afternoon males between 25-65 at 34.2%. This also showed that informal vendors increased from 9 in the morning to 29 in the afternoon, of which most were positioned along Cr99 or opposite the station. In Santo Domingo the majority group in the morning was males between 25-65 at 38% and in the evening males between 16-25 at 41%. Here informal vendors also increased dramatically from 3 in the morning to 17 in the afternoon, reflecting the increase of people and the relaxed attitude of a Saturday night, when many residents spill out onto the streets.

The land-use survey also indicates the importance of Cr99 in San Javier, revealing it as an important high street. This can be seen with the majority of formal shops being located here, alongside informal vendors, revealing how both formal and informal commerce is linearly positioned along this route. Interestingly, this also revealed a small centre by Cr100, on route to a neighbouring informal settlement. However, in Santo Domingo commerce does
not form along the busiest roads, but instead cluster at important junctions, where the variety in commerce is also strongest. It should be noted, that throughout Santo Domingo there are many places to drink and eat, ranging from formal restaurants to irregular bars to eateries that function out of a window, making commerce hard to categorise and locate on a map (Fig. 7).

![Image of land-use maps – Santo Domingo (left) and San Javier (right). The area surveyed is highlighted. The black blocks are interventions and the coloured block are commerce (red = drink, blue = food, green = bakery, yellow = gambling, purple = supermarket, orange = billiards).](image)

Findings

This paper set out to investigate and discuss the connection between the spatial impact of cable-cars and local socioeconomic changes. This principally reveals that the cable-car contributed by supporting the existing movement patterns around both San Javier and Santo Domingo and from this local commerce is reinforced, potentially making both neighbourhoods more resilient to future change. This is clearly revealed by the connection between the ‘choice’ measurement in the spatial analysis, movement patterns and the location of commerce. Whilst the position and type of commerce is different for both cases, movement and the urban grid influence them both.

The spatial model suggests the biggest spatial impact is in the neighbourhoods that have been densely packed in the past and have since consolidated the urban environment, without a direct connection in and out the neighbourhood, such as the area surrounding the first cable-car line. Therefore the additional line provides a direct connection to other parts of city, providing greater integration. However with the second line the surrounding area is
sparser and an additional line connects fewer people, since it is not improving integration. The spatial model also reveals how the impact is less in areas were the grid is already well integrated with the city, such San Javier, whereas in Santo Domingo the poorly connected urban grid means the introduction of a direct connection has a greater integrational impact.

When the spatial and onsite analysis is overlaid it becomes obvious that Cr99 in San Javier and Cr31 and Cr32 in Santo Domingo are the most important ‘through’ spaces, as both the spatial analysis and movement patterns strongly relate. This shows that the location of each station has helped to support movement and possibly create a well-positioned hub for the community, suggesting the decision where to locate a station is very important to its success. This could further provide an opportunity to reinforce and build upon the existing successes of the urban grid. In San Javier, the importance of Cr99 as a ‘through’ space has been reinforced with a variety of commercial land-uses establishing a recognisable high street. This is not the case in Santo Domingo, instead the largest variety of commercial land-uses cluster at important junctions, where busy ‘through’ spaces meet. This relates to a larger variety of movement, whereas in Santo Domingo movement is mostly linear alone Cr99. Therefore, not only does a well positioned station reinforce the successes of an existing urban grid, but it starts to provide a focal point for the neighbourhood were the majority of residents move towards or coming from, providing reliable locations to positions commerce, both formal and informal, which would not be possible with a current bus system, that stops wherever the users requests (Fig. 8).

**Reflection**

This paper has attempted to make a connection between spatial connectivity and existing socioeconomic conditions using spatial analysis and onsite observations of movement and commerce. Yet, by doing so it has revealed elements that need improving.
The spatial analysis clearly shows the impact of the cable-car when comparing 'with' and 'without' models of the city, yet there are local elements that have been missed. Typically a Space Syntax method produces two-dimensional results and does not take into account topological factors or dynamic variables such as transport, yet these clearly influence movement and connection time. Therefore, future spatial analysis should investigate how spatial connectivity can be weighted with journey times, since 'time' represents a clear indication of how quickly certain areas of the city can be reached, no matter the transport used. This offers the potential of the analysis to be more dynamic.

Also, whilst the land-use surveys used relate to movement patterns and spatial analysis, some of the commercial activities were unrecorded because they were irregular and temporary, making them very hard to record in a traditional survey, especially during time limited fieldwork. Yet, no matter how irregular or temporary the commerce is it positions itself spatially to pickup business. Therefore an expanded survey is needed to take into account dynamic forms of commerce, one that covers different times of the days and measures the varying forms of commerce, not just fixed locations.

Furthermore, this study needs to expand beyond two cases, to prove these initial findings and demonstrate a stronger connection, between space, movement and commerce. Within this a spatial analysis of the supporting projects is also required, to formulate an understanding of how these relate spatially and socially to each cable-car station. It is clear from past studies into cable-cars and Medellin that these supporting projects are considered equally pivotal to the transformation.

As the use of innovative modes of transport, like the urban cable-car, increase there is the important question about the impact these have and what role they play in urban transformation. This paper attempted to go a small way in answering this, by discussing the relationship between spatial connectivity, movement and local socio-economic condition. Highlighting how through improved spatial integration, local commerce can be enhanced, both formally and informally and this could provide areas of urban poverty with commercial resilience to alleviate residents socially and economically.
References


Session 11

Collective Agency 2
Collective Actions for Local Resilience: Learning from grassroots strategies in São Paulo

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ABSTRACT Significant lessons can be drawn from grassroots experience of self-organising to challenge the uneven distribution of urban resources and opportunities in cities. This paper examines the household and community strategies used by low-income dwellers living in squatted buildings in the city centre of São Paulo, and asks how resilience narratives can help understand and articulate the outcomes of these micro strategies of citizenship across multiple scales. The city centre of São Paulo is increasingly a key site for local housing movements to challenge the rules and practices of spatial injustice in Brazil. In a context where housing for low-income groups is in short supply and, critically, continues to be characterized by highly skewed social and spatial distribution, squatted buildings have emerged since at least the 1990s as laboratories for the production of alternative ways of inhabiting the city. The paper reflects on a transdisciplinary action-research project taking place in the city centre of São Paulo. It explores the networked strategies of individual and groups inhabiting a building known as Ocupação Marconi, and it focuses on the production of the building being seen as a device for generating collective resilience from the micro-scale. The aim is to discuss how attention towards similar micro strategies might allow for bringing out the transformative potential of resilience thinking.

KEYWORDS: Grassroots practices, social movements, insurgent citizenship, bottom-up urban regeneration, São Paulo.

Introduction

Stop calling me RESILIENT. Because every time you say, ‘Oh, they're resilient,’ that means you can do something else to me. I am not resilient (#notresilient).

Resilience thinking has drawn attention to the risks facing coupled social-ecological systems, with relevant consequence to a number of fields. Social-ecological resilience has been framed as the capacity of a system to deal with incertitude and, crucially, transform in the face of strains and stresses. This capacity involves flexibility, diversity, and adaptability, and is defined on the basis of a range of principles including the understanding that all socio-ecological systems are complex adaptive systems, and that persistent change – rather than stability – is the key characteristic of ecological and social realities alike. Moreover it
highlights how change occurs through myriad interactions across diverse spatial and
temporal scales.

Resilience is also, however, an elastic notion and indeed a ‘contested narrative’ (Scott
Powell et al., 2014). Whereas environmental sciences have highlighted its progressive
potential, a range of debates around the broader usage of the term – particularly in social
sciences – has focused on the political content of the concept. Here, I am particularly
interested in exploring the consequences of thinking through notions of ‘local’ or ‘community
resilience’ (‘resilience from below’) in relation to marginalised urban groups, their
perspectives, and their priorities.

Within this context, critics have emphasised that resilience thinking eludes notions of
power and politics, and that resilience narratives often seem to evade the possibility that
extant (social, economic, political and ecological) circumstances generating incertitude might
be subjected to a wider structural critique. As a consequence it has been observed that
narratives surrounding ‘community resilience’ risk developing within largely dysfunctional
social framings, characterised by the unequal distribution of power and resources
(MacKinnon, 2012; Jonathan, 2013; Cretney, 2014). As highlighted by Michelsen, ‘such
framings avoid the fundamental democratic questions about what social, economic and
political rights and lives citizens experience, aspire towards, and demand’. In short, as Adger
states, ‘resilience theory in itself does not deal with the normative dimension, so – by
implication – it needs to be used in conjunction with other concepts that do’ (Leach, 2008: 9).

Secondly, it has been discussed that in mainstream usage resilience tends to be
conservative, focusing on the maintenance of structures and on the ability to ‘bounce back’
from shocks. Leach (2008) and Shaw (2012) on the other hand highlight that social-
ecological resilience rather entails a dynamic process of ‘bouncing forward’ – a necessity to
transform and innovate to overcome stress. This in turn raises a fundamental question about
the end point of such transformations: which concerns about the future are foregrounded,
and whose future aspirations are pursued in this process? In other words: resilience for
whom, and for what ends? In a reflection on the emerging consequence of resilience
thinking in the realm of urban planning, Davoudi highlights that “the same problematic has
always been evident in sustainability and planning, in urban regeneration and in many other
places within the field where processes of depoliticisation and normalisation produce
perverse policy constructs. The definition of an end point is clearly a political question”
(Davoudi, 2012: 332).
Resilience as a radical agenda? 

In dialogue with these reflections, this paper explores the practices of urban dwellers and organised housing movements in São Paulo, Brazil, as a means to explore how ‘community resilience’ may be associated with ideas of rights, power and agency, and to the mechanisms underpinning the construction of citizenship. The aim is to contribute towards a transformative definition of ‘community resilience’, within a framework whereby a will to social justice is central, and resilience is geared towards supporting the needs and aspirations of marginalised groups. The paper questions how the ‘resilient practices’ (Petrescu 2012: 65) of urban dwellers who have been excluded from the circle of citizenship can potentially challenge the uneven distribution of urban resources and opportunities in cities, and shape and frame radically alternative urban imaginaries. Community resilience is broadly understood as a ‘de-centred, de-commodified and de-carbonised alternative’ (Brown, 2011: 14), involving the capacity of communities to resist disruptions from environmental, economic, and political crises, and to challenge ‘the underlying structural issues of power and inequality that might be contributing to the presence of [such] disruptions’ (Cretney, 2014: 22). Resilience is in this sense ‘a great new fiction – to recall Badiou’s words – [creating] real possibilities for constructing different urban futures’ (Swyngendouw 2007: 71). As a radical critique to the status quo of inequality and marginalisation in cities globally, ‘community resilience’ requires in this understanding a form of politics ‘that changes the very framework that determines how things work’ (Žižek 1999: 199). Arguably, at this intersection between citizenship claims and transformative change, ‘community resilience’ – encompassing the self-organised tactics enacted by marginalised individuals and groups in response to the profound uncertainties they experience – acquires new political significance.

In exploring the practices of social movements in São Paulo, the paper aims to highlight how these practices might inform this definition of resilience as a practice that resists disruptions by producing shifts in the conception of what is possible, and by performing radically different ways of making urban space. The point of departure is that the concept of resilience bears within itself the potential to frame collective forms of inclusive citizenship and city-making that are based on micro-scale activism and the radicalization of everyday life, and are geared towards more just societal relations at multiple scale levels (MacKinnen 2012).

Framing citizenship in Brazil

In his seminal work on ‘insurgent citizenship’, James Holston argues that the Brazilian context highlights the contradictions between citizenship, or societal belonging, as a legal
status as opposed to its lived experience. Holston bases this consideration on a two-fold argument. Firstly, citizenship in Brazil emerges as a combination of two conditions: “one is formal membership, based on principles of incorporation into the nation-state; the other is the substantive distribution of the rights, meanings, institutions, and practices that [societal] membership entails to those deemed citizens” (Holston 2008: 7). These are termed as formal and substantive citizenship. In the case of Brazil, “this combination … has generated a national citizenship that is universally inclusive in membership, and massively inegalitarian in distribution” (Holston 2008: 8). His second argument is that certain practices of production of the built environment, such as self-built urban favelas, can articulate different ideas and practices of citizenship – challenging the reality of social exclusion by concretely experimenting alternative modes of making the city. These two arguments are equally relevant when exploring the occupation of vacant buildings by housing social movements in São Paulo.

Parallel to the construction of favelas described by Holston, in São Paulo since the mid-1990s marginalised groups have reclaimed the abandoned centre of the city, and re-claimed its empty buildings through alternative forms of popular housing and self-made urban regeneration. Through their daily practices, low-income urban dwellers have turned the unoccupied buildings of the city centre into a socially organised and politically innovative urban area. In this process, the occupation of vacant buildings by social movements has transformed the city centre into a space of radically alternative futures – produced in the experiences of collaborating, networking, organising, and being recognised by other citizens and by the State.

In this process of collective production of urban spaces and imaginaries, an expanded definition of citizenship is in the making. Such definition emerges through discourse as well as through the practice of citizenship rights – and particularly, through the practice of the ‘right to the city’ as defined by the City Statute and the Brazilian Constitution.

Here, I will examine this process of making as it emerges in the practices of a group occupying a building known as Ocupação Marconi, situated in the city centre of São Paulo. Building on the narratives of residents that the occupation of the building is a device to broaden participation and rethink collective governance across multiple levels, I utilise three lenses to explore the ways in which this device might function. The first refers to the ways in which social diversity is experienced, and political subjects are constructed, in the building; the second considers practices of solidarity in the governance of the building; the third explores how the lessons from the building can trigger new forms of recognition by influencing government’s policy and planning frameworks (De Carli and Frediani, 2014).
Citizenship practices in São Paulo

The access to and control over spaces in the city centre of São Paulo is highly contested. Since the 1980s, as the city encouraged the formation of new economic centres in non-central locations of the city, property prices in the inner city area decreased. However, even if depreciating, properties still retained relatively high economic value based upon the assumption of future regeneration. As a result of speculation practices, but also a series of legal bottlenecks, nearly 300,000 housing units were reported empty in 2010 (Earle, 2012). Meanwhile, these new economic centres started generating increased property values in central locations, contributing to the peripheralisation of the urban poor.

Under these conditions, empty buildings in the city centre became more and more an attractive location for the urban poor due to important advantages in terms of access to public transport, informal and formal livelihood opportunities, cultural activities and public health and education facilities (Kohara, 2013).

This scenario provided the crack that local urban housing movements started to exploit in the late 1990s. Drawing from experiences from the Sem Terra (landless) workers’ movement, the Sem Teto (roofless) occupations reclaimed inner city buildings as a means to draw attention to, and question, the logic of commodification of the city, and to reclaim the right for the urban poor to remain in well-located urban areas. These occupations seek to set precedents to reclaim the inner city by demonstrating an alternative appropriation of buildings based on the collective production of urban space. They are often carefully studied acts of civil disobedience that take into account the physical and legal conditions of the building, to identify optimal moments and places. Once a building is occupied, collectives are set up to manage its maintenance, and to discuss emerging challenges. Furthermore, occupations are not isolated and fragmented actions, but are rather assisted by extended networks of institutions, non-governmental organisations and civil society groups providing legal, technical and social support for social movements in their struggle to activate unused properties and re-appropriate the city centre.

The making of Ocupação Marconi

Designed as a office block and situated in an area characterised by the high density of infrastructure, services and amenities, the building known as Edificio São Manoel in Rua Marconi had been emptying out since the 1980s, and in 2012, the only spaces in use were the commercial units at the ground floor. Since September 2012, the building has been squatted by a housing movement called Movimento da Moradia Para Todos (MMPT). Today, it is identified as Ocupação Marconi and is home to approximately 130 low-income households – including a high percentage of national and international migrants.\(^2\)
Diversity

Issues of social diversity emerged strongly during interviews with residents, and especially from the story of Emmanuel, a young man of Haitian origins living in the occupation with his partner and child. Emmanuel, like many others, did not become involved with the occupation on the grounds of his political views, but rather on the basis of his present needs and aspirations for the future. Since 2013, living in the occupation has allowed him to have a place to stay in the city; to create new livelihoods opportunities; to raise his daughter. Emmanuel’s sentiments when talking about the occupation echoed what many dwellers also expressed during our conversations: that the building is a landing place – an “entrance” or “arrival” to the city – as well as a platform creating the social and material conditions for a better future.

Ocupação Marconi and similarly, other occupations in the city centre, are heterogeneous realities where diverse stories and experiences of exclusion and marginalisation coexist and entangle. The building represents an answer to a plurality of living circumstances, needs and aspirations, and a device for producing and pursuing a multiplicity of alternative futures. Cutting across this multiplicity, the occupation is also a common ground of aspirations for the future and hopes for a new life, as well as of everyday difficulties generated by the overall state of precarity, the scarcity of resources, the sometimes conflictive proximity to neighbours, and the norms governing communal life. Nevertheless, the occupation is also portrayed described by residents as a shared home to inhabit, and this mix of positive and negative associations generates a sense of belonging and eventually, the emergence of a sense of belonging.

In summary on the one hand the occupation is a personal resource. It is the infrastructure that allows for building new life conditions – where the lower costs of living, the proximity to public transport and facilities, the availability of informal jobs, make up the material and immaterial conditions for pursuing change for one’s self, for one’s city. At the same time it is through the entanglement of these different stories that new political subjectivities are formed. By participating in the occupation, individual life trajectories gain presence and meaning vis-à-vis each other. This simultaneity of otherwise marginalised histories, now in relation to one another, becomes visible both to the building’s residents and to other social actors in the city, it acquires collective meaning, and it becomes political.

Solidarity

A second aspect refers to the practices of solidarity in the governance of the building. In the linking of individual life trajectories, the expanded exercise of citizenship or ‘collective belonging’ appears most evidently in the day-to-day maintenance of the material and
immaterial infrastructure of the building. This includes daily rotas for cleaning the hallways and other common spaces and for the removal of waste, the collective management of the communal kitchen, the sharing of child-care responsibilities at the building’s nursery, the maintenance of hydraulic and electrical installations. As part of their shared activities, residents have also run a series of seminars on citizenship education aimed at developing their own capacity to navigate their rights and responsibilities, particularly in relation to questions of housing rights and urban policy making.

One of the building’s coordinators, Francisco, emphasised that the management of communal spaces and activities is based on principles of general interest and collective governance. The building’s governance is organised through a floor-based structure, where each floor is administered as a semi-independent unit and coordinated by a floor representative, like himself. This allows for a detailed management of the communal toilets and of other self-started services such as garbage collection and cleaning. He illustrated how at each floor, dedicated signboards mediate the communication among residents and with the floor representative. This floor-based system is networked through weekly assemblies including all residents, and is coordinated by a building representative. This representative is in turn the interface between the building and the leadership of MMPT. The relations between the building and other housing movements in São Paulo are also governed through a similar structure of nested forms of representation.

During the interviews, several residents underlined the challenges of living within the framework of a shared set of norms that govern many aspects of their personal everyday life. Francisco, while recognising those challenges, also argued that these norms are “necessary for the common good” – for instance, they guarantee safety by prohibiting the consumption of alcohol and drugs in the building; or they distribute costs and burdens, by establishing the need for everyone to financially contribute to the maintenance of the communal toilets. Across the building, different forms of belonging and cooperation are continuously re-invented through these norms and other forms of negotiation of daily relations. It is through these activities and the participation to the building’s assembly that residents, linking across their differences, generate new solidarities, reciprocities, and forms of communal living that directly and indirectly challenge the structures of power that promote exclusion in São Paulo.

Recognition

The third lens refers to the sphere of recognition, and it examines how Ocupação Marconi has been positioned by its own residents as a model of social housing that is collectively produced, and situated in well-located areas.
One of the initiators of the occupation, Raquel, underlined two key roles that the occupation plays in reshaping the relationship between housing movements and external actors. Firstly, Ocupação Marconi has been challenging the on-going stigmatization and criminalisation of social movements across the city; and secondly, it is demonstrating the existing gap between innovative models of housing production in the inner city and the current policy and planning framework. Raquel described a series of initiatives undertaken by residents to change the public perceptions of informal housing occupations. For instance, following an eviction lawsuit started by the building’s owner, pictures of all residents were collected and attached to the documents to be submitted for judicial procedure – as a means to bring personal stories to the judicial processes, and make judges aware of the vulnerability of occupant households and of the role of the occupation in their lives. Other initiatives included Sunday breakfasts held on the street in front of the building, with the objective to introduce residents to their neighbours and passers by; or the introduction of the occupation into the international ‘couch surfing’ network.

Meanwhile, Raquel emphasized that instead of focusing on antagonistic relations to the state, Ocupação Marconi and MMPT, together with other movements, are strategically setting precedents for alternative modes of housing production in inner São Paulo. Through a realistic and detailed understanding of the wider policy environment, the emphasis of the claims advanced by housing movements is on revealing avenues for mainstreaming such a model. This has lead to a series of openings from public authorities to recognise the occupations as agents in the debate around affordable housing in São Paulo. For instance, representatives from housing movements have been key actors in the ‘Conselho da Cidade’ (a working group involving civil society and state actors on issues of urban development). Their engagement has resulted in the introduction of key norms in the strategic plan of the city, including the zoning of five occupied building as areas for housing of social interest. Such advances represent significant successes for the recognition of the need for social housing in well-located sites, however not necessarily recognising the model of housing production underpinning the movements’ practices.

Concluding remarks

The case of Ocupação Marconi illustrates how the social production of the building is part of a process of renegotiating citizenship and societal belonging in São Paulo. Firstly, through the experience of the occupation, personal life trajectories acquire collective meaning, and thus become political. Secondly, the negotiation of daily relations contributes to deepening bonds of solidarity and mutual-help, producing a sense of shared responsibility. Thirdly, the
occupation has been articulated as a catalyst, changing public perceptions and relations with
the state, and using collective action across networks to transform urban policy.

These practices shed a light on the potential of understanding resilience along the lines
that Petrescu highlights, as ‘a necessity to transform’ and ‘a driver for collective creativity’ –
vis-à-vis precarious living conditions generated by structural inequalities and power
imbalance. Seen through this lens, the social production of the building is a collective
mechanism to address individual life uncertainties, while also challenging the wider
conditions that produce them. Here, urban dwellers who have been excluded in fact or law
from enjoying the rights of citizenship, collectively engage in a struggle to respond to their
own immediate challenges, while also contributing to transform the societal relations that
cause incertitude.

In this sense Ocupação Marconi solicits fundamental political questions about the form
and future of cities, as well as to what a commitment to ‘community resilience’ might mean in
the contexts of highly skewed distribution of power and resources. The definition that
emerges here is in line with Cretney’s terming of resilience as the ‘strength of communities’
(Cretney, 2014), and the capacity of ‘alternatively organized communities’ to restructure ‘the
very framework that determines how things work’ (Žižek 1999: 199). Within such definition,
the experience of São Paulo’s social movements organizing around housing and citizenship
suggests a number of themes for further reflection.

A first theme concerns the definition of what constitute a disturbance to ‘community
resilience’, and the scale at which disturbances are observed. The underlying social
processes that shape and hinder community resilience are largely located at the scale of
urban, regional, national and transnational power relations (MacKinnon and Derickson,
2013). If such large scale social and spatial processes impacting on communities are not
addressed, the notion on ‘community resilience’ risks reproducing a sense of ‘responsibility
without power’ – whereby marginalised urban dwellers are expected to generate
mechanisms of self-reliance to cope with dynamics they cannot affect.

This leads to a second theme of reflection, which concerns resilience-theory’s
understanding of society as a complex system, and the awareness that the complexity
shaping the life of communities is shaped by implicit and explicit interactions between
politics and everyday practices. In order to transform the life uncertainties affecting
individuals and groups, ‘community resilience’ needs to be articulated on the grounds of a
cross-scaler politics of relations that mobilises links of reciprocity and solidarity across
different sectors of society, while also challenging the disempowering local, national and
supranational processes.
A third a final theme of reflection, among others possible, is related to the principle that persistent change – rather than stability – characterizes ecological and social systems alike, and the understanding that small changes can produce large-scale transformations in the long run. Ocupação Marconi in particular demonstrates that for incremental change to affect structural imbalances, this needs to be geared to producing *shifts in the conception of what is possible*, and to set precedents of alternative forms of city-making. This links to the notion that dweller’s ‘capacity to aspire’ is a key resource required to contest and alter the conditions producing their marginalization (Appadurai, 2004), as much as is their capacity to engage with complex decision-making processes and policy frameworks. In the case analysed here, these were tested through ‘citizenship workshops’ and other pedagogical initiatives carried out by social movements within occupations and across São Paulo.
References


Notes

1 The analytical framework used to examine the case of Ocupação Marconi was elaborated in collaboration with Alexandre Apsan Frediani and is articulated in B. De Carli and A.A. Frediani, 2014.

2 The following text is based on field work conducted by the Author in August 2014 together with Alexandre Apsan Frediani, and students from the Programa de Pós-Graduação em Planejamento e Gestão do Território, Universidade Federal do ABC (UFABC).
In our mountains we construct on that which remains of a culture of solidarity and love for the soil, in order to experiment with new forms of economy, agriculture and culture. We do so by digging into local memory but also by opening up to the memories and knowledges of other peoples. Montagna Viva

Fig. 1. “Riprendiamoci il parco di Monchio” (“Let’s take back Monchio’s park”), 2009 – the first popular action carried out by Montagna Viva. Image courtesy: Montagna Viva.

In April 2015, we travelled to a village in the Northern Apennines in Italy to visit the citizen-led initiative Montagna Viva.¹ This two-day excursion was part of an ongoing series of exchanges we have been cultivating with initiatives experimenting with the commons, radical education and practical making, whilst also developing (as Brave New Alps) a project
dealing with the question of how to foster non-capitalist spaces in the rural area of the Southern Alps where we both grew up. These exchanges are driven by a yearning to create alliances that strengthen and inspire everyone involved. For us, these alliances can also help counteract the sense of isolation – and possible worthlessness – that may arise when activating cultural projects for progressive social change outside centralising and catalysing metropolitan nodes. While enacting this yearning for connectedness and dialogue, we inscribe ourselves in a feminist knowledge politics that is about working out shared meanings and creating transversal conversations as a “mapping gesture” (Puig de la Bellacasa, 2002), which charts operational points for orientation and further conversation. In this sense, by writing this text, we want to open up our conversation with Montagna Viva for others to join in and to (hopefully) find elements that energise, nurture and trigger multiform experimentation in a diversity of contexts.

Situating Montagna Viva

Montagna Viva - Associazione per il fare in comune (“The Living Mountain - Association for making in common”) is an Italian association that is active in and around Monchio since 2009. Monchio, a rural village with 300 inhabitants, is located in the Northern Apennines, about one hour car drive from Modena, in the region of Emilia Romagna. Montagna Viva was founded by a group of friends and neighbours living in the village, following the initiative of Dagmar Diesner, a German migrant rights activist and video maker, and Massimo De Angelis, an Italian political economist and autonomist Marxist theorist who has written extensively on the commons. At the time the association was born, the couple and their two small children had only recently relocated from London to Monchio, this being the village where Massimo (brought up in Milan) would spend many of his summers in his family’s holiday home.

Situating Dagmar and Massimo

Dagmar and Massimo are both highly educated, with a very broad set of interests, who at a certain point decided to pull out from their urban life and the mostly urban-based struggles they were involved in, in order to radicate their lives and their activist practice in a place that stands in stark antithesis to London. For us, it is interesting to reflect on how they managed to transform their new everyday environment into a testing ground for communal speculations and experimental interventions, and where to activate in practice a profound interest for the commons and practices of commoning.

Having previously lived, studied and worked in a global context and been involved in the alter-globalisation movement, migrants rights struggles, the European Social Forum, and anti-GMO protests, moving to Monchio, Dagmar and Massimo brought with them the desire...
to contribute their knowledges and experiences to the wellbeing of the village and its surrounding area. Moreover, they brought with them an attitude, which, rather than focussing narrowly on the problems that affect the everyday of this small locality without inquiring where these come from, they recognised the importance of addressing the multiple connections that tie peripheral places such as Monchio to the global context that they act and evolve within. Thus, Massimo and Dagmar brought with them the need to find and create meaningful relationships between their new everyday experience and the phenomena and struggles taking place in other parts of the world.

**A descriptive account of the association’s activities**

In its early days, Montagna Viva was called Monchio Vive (“Monchio Lives”) and was constituted by an informal self-organised group of citizens, who first gathered around the initiative *Riprendiamoci il Parco di Monchio* (*Let’s take back Monchio’s Park*, 2009). Under the motto “They told us to get by and so we get by”, this initiative aimed at repairing, cleaning and revitalising the municipal public park, which had become semi-derelict because – as members of the group were told – the municipality did not have the money to look after it. On that occasion, a large number of inhabitants gathered at the park, bringing their skills, tools and materials, but also food, drinks and music. In just one day, the group managed to completely restore the park and its features in a joyful and convivial, almost party-like atmosphere.

Encouraged by the success of the initiative, a few months later, some members of the newly formed group proposed to occupy Monchio’s elementary school, at the time being threatened with foreclosure as a consequence of the cuts to public spending and the small number of children attending the school. This proposal of occupation included taking over the teaching activity, thus activating the knowledges and skills held by the various parents. Being conceived more as a quick act of resistance with an eye to set in motion the local media machine – almost in the style of Juan Manuel Sánchez Gordillo, the famous mayor of Marinaleda, the small communist utopian village in Andalucía³ – however the planned occupation was not carried out, but members of the group are sure that the idea of this direct action reached the local politicians by word of mouth as indeed, six years later, the school is still open.

These initial proactive and somewhat mischievous activities were followed by the constitution of the association Montagna Viva and with more imaginative initiatives and actions, including two children’s parties; the collective writing and performing of several theatrical plays based on globalisation and food (Fig. 2), GMOs, and the Nazi fascist massacre of partisans in Lama di Monchio and surrounding villages in 1944; and several
events under the title *Noi ed il mondo* (*Us and the world*, 2011) (Fig. 3), which brought attention to concerns such as climate change, migration and the oppression of women. Moreover, Montagna Viva joined in with already established activities such as a variety of village celebrations, the local scarecrow competition and nativity scene exhibition, but always taking a critical anti-capitalist stance and expressing this through the objects produced for these events. Another important highlight to note was that in 2011 Montagna Viva established the community garden *La Cuccagna* (*The Abundance*) (Fig. 6 and 7), which is ongoing and is linked to several other initiatives such as restoring an old fountain (Fig. 4 and 5) and campaigns around water as a common good.

Fig. 2. A scene from the theatrical production “Il nostro Pane quotidiano” (“Our daily bread”), 2010. Image courtesy: Montagna Viva.

Fig. 3. “Donne del mondo: tra crisi e beni comuni” (“Women of the world: between crises and the commons”), a public event with Silvia Federici as part of the series “Noi ed il mondo” (“Us and the world”), 2011. Image courtesy: Montagna Viva.

Fig. 4. Restoration of the old lavatory in Lama di Monchio, 2012. Image courtesy: Montagna Viva.

Fig. 5. Inauguration of the restored lavatory, 2012. Image courtesy: Montagna Viva.
Relating the local to the global and vice-versa

As these actions and initiatives show, the people involved in Montagna Viva are moved by the desire to face and transform, in a slow and collaborative manner, different problems that affect the village, the territory it is part of, and the wider global context localities like this act within. Indeed, what the association considers as its arena of speculation and intervention⁴ goes well beyond the uniqueness of the local with its specific problems, and is instead made of those points in which the local and the global intersect – where current multiform global environmental, social and economic crises impact on the local environment, society and economy. The evident symptoms of the global violently bursting into the local are not tackled uncritically by Montagna Viva, which instead sees them and the activities organised to ‘do something about them’ as important occasions to address the way globalised capitalism works, and to pose the question of how we can become more aware of its mechanisms in order to understand how globalisation plays out in our daily lives and what we can do to imagine alternatives to it. The local therefore moves from being a passive victim towards a terrain for imaginative experimentation. Like this, questions around the agency held by the local in moulding these impacts, but also around its responsibilities towards other localities and peoples in the process of constituting the global become very relevant⁵.

Here, our considerations are very much influenced by Doreen Massey’s argument in her text “Geographies of responsibility” (Massey, 2004). By drawing on the work of Arturo Escobar and Ash Amin, she shows how any locality is not always necessarily only a victim of
the global forces and dynamics it is exposed to, and how some places are less victims of the global than others. Though Monchio is for instance less likely in the position to influence the global than a metropolis such as London – with the flows of capital it directs, the policies it implements, and the social movements acting in it – it is undeniable that the local economy and the lifestyle of people living in Monchio have very obvious effects on other places and peoples on Earth. Importantly, Massey draws on the work of J.K. Gibson-Graham to address the agency that the local has in the way that it models global forces coming from outside to specific local circumstances. Re-imagining capital and the global happens on a local level, as every place and its people have a varying degree of agency in ‘interpreting’ globalisation – welcomingly embracing it, resisting it and fending it off, or building alternatives to it (Massey, 2004). If this, however, has the power to determine how globalisation acts itself out in other places, it depends on many factors.

Making in common, making the commons

As the website of the association states, "Making in common is our philosophy to face the big problems of the crises we are going through and that are the effect of a world that is unjust, unequal and dominated by the making of profits. (...) Making in common is the means this association uses. This, however, is not in a technocratic and bureaucratic way, but with the kind of associative spirit we adopt when we get together to do a project that makes the best in us come out (Montagna Viva, 2015b)." Like this, the communal act of making constitutes a methodological framework, a vector that entices and brings people together. On one hand this represents a fertile ground from which to start learning about and addressing together the causes of the problems provoked by the global-local interplay. On the other hand it is a means to make, to build community as "a web of direct relations among subjects whose repetitive engagement and feedback processes allow them, through conflict and/or cooperation, to define the norms of their interaction on the basis of other values than those of capital (De Angelis, 2007, p. 65)" and, therefore, to make the commons.

The commons and the practice of commoning, as a material and social dimension that empowers people to nurture other values and ways of relating than the narrow ones embodied and reproduced by capital (De Angelis, 2007, p. 192), indeed constitute one of the theoretical frameworks informing the activities of Montagna Viva. What we find interesting here, is the fact that Massimo and Dagmar are amongst the people who have co-constructed this framework, which today serves as a reference point for many who work towards progressive social change, and that they direct their actions and experimentation within Montagna Viva and in accordance with it. However, the understanding of these concepts by the other members of the association is arguably very different and less complex, which certainly does not mean that they do not relate to these ideas and the ways
of doing them. Indeed, all the members of the group do constantly common in the way they run the association, take decisions, plan activities, negotiate what and how to cultivate in the garden, etc. But possibly they are not aware of the long-term potentials and challenges that are connected to experimenting with these ideas, and of the strategies and tactics that are deployed in other initiatives and projects revolving around the commons in order to deal with the tensions and conflicts that may arise along the way.

As in every situation of collectivity, Montagna Viva also has had tensions running through it and gets stuck at certain points where activities do not work out as planned. In dealing with these tensions and blockages in constructive ways, we had a sense that it is important to get everyone involved enthusiastic about adopting an ethos of continuous research and experimentation. Acting with such an ethos opens up the possibility of changing one’s mind, trying something out and evaluating it within the group, changing direction and taking risks. So one big question that arises is how to create an association of inquiring minds and hands that want to explore how things can be done differently. For example, if we speak about commemorating the massacre of WWII, how can a sense of excitement be created about challenging what such a commemoration is, and what politics it proposes and what transformative relevance it can have today? On a theoretical level, for example on the texts on Montagna Viva’s website, this spirit of research and diversification of possibilities for each activity is spelled out, but in practice not everyone embraces it, which in turn creates frustrations and tensions as the imaginaries about what the various initiatives of the association should be vary quite strongly from person to person within Montagna Viva. In fact, at Montagna Viva, taking each initiative and decision through several iterations – also over several years – is a key component in working through contested and contentious issues. Producing commonality in the everyday to overcome divisions created by capital is the formula the group follows.

We are convinced that a shared spirit of experimentation and speculation, through which to liberate ourselves from the narrow mental constructs of our everyday, is a vital element to actuate what Montagna Viva strives to achieve: departing from practical activities of making in common and a deep engagement with the surroundings achieve a greater understanding of the locality and what binds it to the global and thus foster people’s power to intervene in it. While this is happening, it seems important to us to also link this ethos of experimentation to the transformation of our subjectivities in order to create and inhabit different possibilities for the future.
Opening up imaginaries

In terms of opening up imaginaries for desirable futures, we feel that one of the strengths of Montagna Viva is its openness in terms of possibilities. Although problems of contemporary economic, social and environmental crises are points of reference, they are not used as terms that dictate every choice that is being made or that sees future disruptions as something inevitable that we urgently must get prepared for. In this sense, Montagna Viva refrains from “holding the future together” (Brown et al., 2012) through an affective governance that mobilises environmental, social and economic crises and disruptions as tools that dictate urgent action in the present. What Montagna Viva is instead working towards is oriented around a nourishing interpretation of *buen vivir*, where resilience is not a discursive disciplinary device placed before the process. It is rather adopting an approach where the openness and desire for creating new (and expanding existing) commons allow for diversity and joy, which form a basis that fosters many other beneficial dynamics, such as a movement towards social and environmental resilience.

Finally, Montagna Viva seems to us to be formulating what we might frame as the question of the *right to the rural*. In a world where the majority of people live in cities and where the rural is framed as a space of backwardness and immobility, on which city dwellers on one hand project romantic ideas of the rural life while on the other hand relying on its productivity and capacity to absorb waste to sustain them, projects such as Montagna Viva experiment with the agency of people living in rural areas in shaping their environment, a dynamic and progressive culture, the personal relations developing within them and its connections to the urban and the global.

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References


Notes


2 COMUNfARE. Exploring popular design and making in common to foster non-capitalist spaces in the Vallagarina district, Northern Italy is being developed in the framework of a practice-led PhD at the School of Architecture of the University of Sheffield.

3 See the detailed account on Marinaleda by Dan Hancox in “The Village against the world” (Hancox, 2013).

4 The term ‘arena of speculation’ was coined in 2008 by Alessandro Petti, Sandi Hilal and Eyal Weizman in the framework of Decolonizing Architecture (now DAAR – Decolonizing Architecture Art Residency), referring to an “intellectual space of critical debate on the spatial futures of Israel-Palestine” (Petti et al., 2010). We here borrow this concept and expand on it, adding the more practical dimension of intervention, which is foundational for Montagna Viva in the sense that the association wants to bridge the gap between theory, study and action in order to effectively change the fabric of its surroundings by intervening in it.

5 For example, this part of Italy is known for its production of Parmigiano Reggiano cheese and balsamic vinegar, two specialities produced locally but that can be found in many supermarkets and restaurants around the world. The production of these commodities en masse relies on destructive industrial farming and agriculture, and on the transport, distribution and marketing systems of the globalised capitalist system.

6 Here, as in the abovementioned initiatives Montagna Viva is directly engaged in, ‘making’ is intended in quite a broad sense, encompassing activities like planning, designing, repairing, building, working the land, building and sharing knowledge, performing, etc.
Resilient Subjects: On Feminist Practices

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Introduction

Resilience is generally defined as the ability of systems to cope with change. Resilience efforts are mostly discussed in technical terms, and in terms of policy, but seldom pose questions of politics, agency, and positionality. In this paper, we propose a shift from regarding resilience under the point of view of systems, to considering it from the perspective of resilient subject_s. This paper hereby reflects on feminist practices and strategies for building resilient networks and imagined communities (Mohanty 2003) that counter-act societal challenges such as political, economic, and social injustices produced by global capitalism and patriarchal power structures. Such counteractions not only re-act to current material and historic conditions but also propose ways of future actions. More specifically, we will discuss three feminist spatial practices of building imagined communities; through a sustained act of resistance, an art piece, and a care strike. We hereby discuss architecture as the “symbolic space of appearance” (Torre 2000) and the transgression between domestic and public space – a recurrent theme in feminist thinking. Subjects are understood both as subjects (i.e. subjecthood) and subjects (i.e. as subject matter).

We will analyse resilient subject_s through three different examples of feminist activist practices across different times and geographies. Using the literal meaning of resilient as our starting-point – at once flexible and strong, supple and tough – we will unpack resilient subject_s in feminist practices with a special emphasis on the following three activities of sharing, counter-acting, and connecting. Therefore, our focus is on how these three activities work together, in the emergence of resilient subject_s, as the basis for building imagined communities against fragmentation, and for transgressing both essentializing notions of pre-given, stable entities of community, and separations between domestic spaces and public spaces. Firstly, we aim to show how these feminist spatial practices create solidarity and connectivity by way of sharing resources and knowledge. Secondly, we seek to foreground how these practices counter-act, violence, hegemonic power relations, or precariousness. And thirdly, we are interested in how, taken together, the practices of sharing and counter-acting connect the domestic space and the public space, by way of transgressing historically constructed and locally situated boundaries between private and public. We state that
feminist practices show that a different understanding of these relations is needed in order to arrive at theorizing and practicing (as) resilient subject_s.

The three examples chosen for this paper include the Mothers of Plaza de Mayo in Buenos Aires (they began their marches in 1977), the activist art project The International Dinner Party (organized by artist Suzanne Lacy in 1979), and the walks and research of the Precarias a la Deriva (initiated in Madrid in 2002). All three examples emanate from common experiences and demonstrate the ability to connect and build up networks and communities. They all work with strategies of activism and art. In different ways, the examples describe the transformation of individuals and groups, and the emergence of new subjectivities through the moving from singular to common practices, as well as the appropriation of public and hegemonic spaces through which these are given new meanings.

Drawing on Chandra Talpade Mohanty's work on transnational feminism, we connect her concept of "imagined communities of resistance" (2003) with the notion of emerging resilient subject_s. They counter-act representational regimes and hegemonic power relations within globalized capitalism. We aim to understand how resilient subject_s, through their transgressive practices, build lasting alignments between the personal, the social, the public, and the domestic. What follows are a number of questions central to our concept of resilience, which is social rather than technological, political rather than policy-based. How can we learn from spatial practices like these? What are the spatial tactics that transgress historically forged boundaries between the private and the public? How can resilient subject_s expand our understanding of the concept of resilience? What are some new forms of sharing, counter-acting, and connecting that are being developed in response to crises?

Resilient subject_s build imagined communities of resistance through practices of sharing, counter-acting and connecting – a theoretical framework

A recent materialist feminist philosophical and political discourse sees opportunities for new social relations, community building, and new institutional practices that aim to foreground resilient futures and empowerment. Hereby, a prerequisite for positive change is the becoming of different subjects (Braidotti 2011, Stengers 2008, Petrescu 2013, Gibson-Graham 2008). In Rosi Braidotti’s words, “[t]he subject is a process, made of constant shifts and negotiations between different levels of power and desire, that is to say, wilful choice and unconscious drives” (18). “It implies that what sustains the entire process of becoming-subject is the will to know, the desire to say, the desire to speak, think, represent” (257). Becoming-subject is not an individual activity, but an interactive collective process that relies upon interrelations and social networks of exchange. Subjectivity composes significant sites for reconfiguring modes of belonging and political practice (11).
In her introduction to *Feminism without Borders. Decolonizing Theory, Practicing Solidarity* Mohanty states that "feminist practice (...) operates on a number of levels: at the level of daily life (...); at the level of collective action (...) and at the levels of theory, pedagogy and textual creativity (...)" (Mohanty 2003:5). On all these levels public space and domestic space, as well as productive and reproductive labour, are complexly interrelated and interdependent.

A feminist political ecology approach highlights less visible scales – the body, the household – but stresses their interconnections from the intimate to the global (Katz 2001, Christie 2006, Elmhirst 2011, Nightingale 2011). It conceptualizes embodiment in its material and emotional dimensions (Grosz, 1994). Feminist conceptualizations of politics and subject formation in political ecology see gender intersecting with ethnicity, age, sexuality, etc. as a constitutive force on all scales of analysis (Elmhirst 2011).

Understood as such, resilient subject_s, in the dual sense of the word, continuously investigate what it means to find common subjects by way of connecting, sharing resources, counter-acting violence, hegemonic power relations and precariousness. Common subjects then become a shared resource. Subjects connect with each other's subject matter. They form "imagined communities" or "communities of resistance" (Mohanty 2003:47). Mohanty uses these terms because they suggest commitment and potential alliances and collaborations across divisive boundaries. They also suggest political rather than cultural bases for alliances. Community is not an essentializing given, a readymade localizable entity. Rather, community has to be produced and reproduced. "Community, then, is the product of work, of struggle" (Mohanty 2003:104). Community-building therefore can be understood as a complex process of becoming political by way of actively producing and reproducing the very politics of community. Thus, it has to be practiced and theorized differently. As it is inherently unstable, it has to rely on transformative practices to come into being. These practices, as we will demonstrate in the three following examples, emanate from transgressive activities, which draw, and sustain, new connections between the public and the domestic realm.

**Mothers of Plaza de Mayo, The International Dinner Party, Precarias a la Deriva**

**Mothers of Plaza de Mayo**

Our first example of resilient subject_s introduces the silent manifestations of the *Mothers of Plaza de Mayo*, initiated in 1977, in the most important public space of Buenos Aires. They have gained considerable international attention and inspired similar demonstrations in other places around the world.¹ The 'Mothers' connected to demand information and justice
for their children and husbands who had ‘disappeared’ under the Argentine military regime between 1976-1983.²

The women first met incidentally at the Ministry of the Interior in the search for information about their missing children and husbands. At the time, public demonstrations were strictly forbidden, and gatherings of more than two people in public were promptly dispersed by security forces. At first, a group of fourteen women came to the plaza every Thursday after work, wearing white kerchiefs to identify themselves to one another. The Mothers circulated in pairs, switching company to share information while observing the rule against demonstrations. In later demonstrations the Mothers also shielded their bodies with cardboard signs representing their missing children and husbands. Eventually, they attracted the interest of international press and human rights organizations.

The Mothers’ spatial appropriation consisted of shared silent private acts, sharing personal issues, stories, and photographs that gained public significance. It succeeded because of its endurance over many years. Initially ignored by the police and national press, because the Mothers seemed to represent no threat, it developed into a “powerful architecture of political resistance” (Torre 2000:142). Women circling the May Pyramid monument in the center of the plaza, their heads clad in white kerchiefs, is now a well-known image.

In her seminal article about the case, architect and critic Susana Torre stresses the significance of the thirty-year-long action for its political impact, but also for its transformative role of a marginalized group to achieve general recognition in a climate that saw women either as politically and culturally colonized populations, or as unintentional agents of a collective social project but not as actively participating in change (Torre 2000:140). Torre foregrounds the tactical practices of the association of the Mothers of Plaza de Mayo for their ability to appropriate a hegemonic space – “the nation’s principle space of public appearance” – on their own terms.³

For most of the Mothers, it was the first time they participated in political statements. They politicized and positioned themselves in society. They also significantly changed traditional understandings of gender representations and conventional assumptions of private and public spheres. This came about through their shift, from embodiment of traditional roles as wives and mothers, to the emergence of resilient subject_s. This emergence occurred both in spite of, and because of, the threat of police violence. Thus, with their struggle to establish human rights, they did not merely inhabit, but also transform the public realm “as transformative subjects altering society’s perception of public space and inscribing their own stories” (Torre 2000:141).

Torre relates the architecture and politics of the body with the architecture and spatial politics of the plaza. She credits the Mothers for their ability to establish presence by their
own means, but also to refunctionalise an existing urban space, and giving it new symbolic meaning, through shared actions. The ‘Mothers’ phenomenon marked a politisation of a group in society previously not associated with resistance. The Mothers are still active in various social and political projects, acting as a constant reminder of human rights. In this sense, the Mothers’ significance surpasses the specific agenda that initiated their acts.

The International Dinner Party

The second example we give here, of resilient subject_s and their practices of sharing and connecting domestic and public space, is the simultaneous worldwide dinner happening The International Dinner Party that took place on March 14, 1979. "Dear Sisters, We would like to ask you to participate with us in a worldwide celebration of ourselves. We are asking women in many countries to host dinner parties honoring women important to their own culture. These dinner parties, held simultaneously 14, March 1979, will create a network of women-acknowledging-women, which will extend around the world." This invitation was originally drafted by a group of California artists. Eventually it fell to Suzanne Lacy and Linda Preuss to organize this simultaneous worldwide dinner happening. It was planned to celebrate the opening of Judy Chicago's Dinner Party at the San Francisco Museum of Modern Art on 14, March 1979. "Inspired by this work, several California artists want[ed] to expand the idea of honoring women from Western history to encompass living women of all cultures."

The International Dinner Party shares the celebratory mood of 1970s US American feminism. Yet, it also points to the fact that women of color, feminists of color, lesbian women and lesbian feminists, had begun to challenge the notion of sisterhood based on the category of woman. We want to propose connecting the 1979 terminology of sisters and a network of women-acknowledging-women to what, in today's terminology, is understood as a political practice of sisterhood and imagined community of resistance, whereby "[s]isterhood cannot be assumed on the basis of gender" but "must be forged in concrete historical and political practice and analysis." (Mohanty 2003:23-24)

We think that The International Dinner Party points to an emerging understanding that sisterhood is based upon concrete historical and political practice. Yet, we also think that The International Dinner Party still assumed that sisterhood could, in fact, be built on the basis of gender. The project both negotiates and celebrates this complex constellation between the politics of sisterhood based on the basis of gender and the politics of sisterhood based on a political practice that includes sharing (dinners), attempts to counter-act the hegemony of US-centric feminism, and connecting domestic spaces (where the dinner parties where held) with a public space (the opening of Judy Chicago’s exhibition at the San Francisco Museum of Modern Art).
The International Dinner Party art project, with its over 2000 participants from different parts of the world, demonstrates the extent of feminist organizing in a pre-Internet era. Women held dinner parties in 200 places in Africa, Asia, Australia, New Zealand, Europe, North America and South America. Following the task assigned to them by artist and activist Suzanne Lacy, the women collectively drafted messages at their dinner parties and sent them off via telegram to the San Francisco Museum of Modern Art. Upon arrival, these telegrams were put on a map of the world by Suzanne Lacy in a several hours long performance. The messages commemorated women important to the local communities. The women remembered range from elders, community leaders, and grandmothers, to artists, goddesses, or activists. Many of the women chose not to commemorate women from the past, but rather to use the telegrams to express demands for a feminist future. Some of the telegrams include references to the 1979 demonstrations of women in Iran that had begun on March 8th. Some of the telegrams make reference to the struggles for women’s sexual and reproductive rights.

In retrospect, the imagined community of resistance that was initiated by the activist art project of The International Dinner Party comes to life through the telegrams and messages written by all the participants. They demonstrate the complexities of situated feminist politics. They also demonstrate the capacity to share resources and to network internationally. The women who hosted the dinners shared their homes, prepared meals, and invited friends and colleagues. They also shared their memories, their beliefs, their convictions, their demands, and their claims with a museum audience. Thus, they connected their domestic space, in which they produced their contributions, with the public space of The San Francisco Museum of Modern Art. Read from a different vantage point, the homes, in which the women hosted the parties for The International Dinner Party happening, appear as the sites from which imagined communities of resistance can emerge. The domestic space appears in its importance of both providing the means of supporting and the means of connecting the emergence of resilient subject_s.

Precarias a la Deriva

In our third and most recent example we explore the emergence of resilient subject_s through the activism and the research of the initiative Precarias a la Deriva, which formed at the feminist social centre La Eskalera Karakola in Madrid. Initially, it was a response to the general strike in Spain in June 2002 and the non-representation of all those – mainly women – who work informally and invisibly, neither recognized by the unions that had called for the strike, nor affected by the legislation that had provoked it (Precarias a la Deriva 2004). A group of women decided to spend the day of the strike wandering the city and talking to women, asking them ‘What is your strike?’ From that common experience a research project
was organized to build a network between highly diverse precarious workers – spanning a wide range; from the freelance designer to the sex worker – to break the solitude and to search for words to speak about what was happening to them. The Precarias formulated the desire to achieve a “collective construction of other life possibilities” through a shared and creative struggle, breaking through the logic of individual maximization, and replacing the profit economy with an ecology of care (Ingrassia and Holdren 2006:43).

The Precarias consider precariousness not as a condition that concerns some and not others, but as a tendency and process that is expanding to include more and more social sectors, which affects society as a whole. It transgresses boundaries between private and public, involving migration policies, the conception of social services, working conditions, and household structures. But while precariousness is usually considered a strictly negative phenomenon describing situations of vulnerability, insecurity, poverty and social exposure, the Precarias add a range of positive qualities to it, such as the accumulation of diverse knowledges, skills, and abilities, through work and life experiences under permanent construction. By re-evaluating their situation, the Precarias actively counter-act generalizing misrepresentations and homogenization. Judith Butler sees precarity in its different extents as forming the starting-point for political alliances against a logic of protection and security for some at the cost of many others.

As a method for research, dérives through the city seemed adequate to encounter and learn about feminized precarious work by moving through “quotidian environments, speaking in the first person, exchanging experiences, and reflecting together with women working in precarious and highly feminized sectors” (Precarias a la Deriva). In contrast to the Situationist drift, the Precarias state: “In our particular version, we opt to exchange the arbitrary wandering of the flaneur, so particular to the bourgeois male subject with nothing pressing to do, for a situated drift which would move through the daily spaces of each one of us, while maintaining the tactic’s multisensorial and open character. Thus the drift is concerted into a moving interview, crossed through by the collective perception of the environment” (Ingrassia and Holdren 2006:34). Isabell Lorey sees the Precarias’ dérive in the tradition of ‘militant research’, generating ‘minor knowledge forms’ for the purpose of self-organization, and creating “linguistic-affective territorialities” between points that do not already have territories a priori at their disposal.

For the Precarias, the development of affective connections are fundamental for overcoming the segmentation and individualization of precarious workers, whose life situations under post-Fordist working conditions demand permanent availability and limited labour rights, where time and care for others become scarce. Thus, the acknowledgement of social relationality as a crucial base from where to act enables a new perspective of a ‘logic
of care’ that enhances the status of care activities as political responses. It counteracts the common ‘logic of threat’ of precarity that cannot provide adequate answers. The perspective of a logic of care led to the common notion of a ‘care community’ or care citizenship, a cuidadania, as the staring point for political-economic considerations, which regarded production and reproduction together, and divested the separation between private and public realms of its foundations. For that purpose, the Precarias call for a care strike. Here a strike does not mean the suspending of care activities. On the contrary, care work is to be shifted to the center, thus interrupting the existing order, and politicizing care work, which, under existing political and economic dispositions, is devalued as being private, feminine, and unproductive, and thus made invisible. Consequently, its conflicts are seldom perceived and understood. The care strike intends to expose the problematic to debate (Lorey 2015:97). The notion of the strike is also a possibility for moving from singular to common practices in which exchanges can happen.

These three cases are inherently different. In spite of that, they share the understanding of the importance of public utterances and visibility for breaking social atomization and for putting discrimination and precariousness as a conflict on the agenda (Precarias a la Deriva 2004). By way of sharing, counter-acting, and connecting they make themselves known as resilient subject_s. The Mothers of Plaza de Mayo do this by leaving their homes, through their bodily presence at the square, and their subversive spatial tactics for making their personal anguish visible. The participants of The International Dinner Party connect domesticity and hospitality to the museum’s space to transgress their isolation and to co-produce a worldwide dinner happening in order to, quite literally, put women's politics of remembering, and feminist claims for the future, on the map. They make visible and exchange their situated knowledges through the public institution of the museum. The Precarias leave their homes and take up a practice of dérive as a form of militant research that transgresses boundaries of domestic space, work-space, and public space. Through that, they want to unveil how counting on the isolation of subjects reinforces the conditions of precarity, but that we are, in fact, interdependent and only separated by false boundaries. Therefore, building the common cause such as a care strike is their step towards forming an imagined community of resistance.

Concluding discussion: theorizing and practicing (as) resilient subject_s

What can we learn from these examples of resilient subject_s? In this paper, we argue that a feminist approach has developed a wider vision of resilience that includes societal and political values expressed in the formulation of resilient subject_s, building imagined communities, and the engagement for political, economic, and social justice.
The becoming of resilient subject_s needs will and desire. Resilient subject_s cannot act in isolation. Understood from the theoretical perspective developed by Chandra Talpade Mohanty, we see community-building, which is the basis for the emergence of resilient subject_s, as a political practice. Imagined communities cannot be assumed on the basis of gender, ethnicity, or religion. They are never pre-given or fixed. Their resilience lies in their capacity to share, to counter-act, and to connect for the purpose of building trust, interdependence, and interplace solidarity, by getting together (practicing politically), by thinking together and knowing of each other (theorizing politically) and, ultimately, by remembering (to learn) from each other (practicing and theorizing politically).

Such practices transgress traditional boundaries and strengthen diverse claims to political and social change, altering assumptions, behaviours, processes and structures for the greater good. They make themselves known by appropriating public and institutional spaces through creative spatial tactics, thus changing structures from within.

As J.K. Gibson-Graham state, while we cannot ignore the power of past discourse and its materialization in durable technologies, infrastructures, and behavior, we can actively work towards creating new discourses, and countertechnologies of economy, and construct strategic forms of interplace solidarity, bringing to the fore ways to make other worlds possible (2008). One way of doing this is by foregrounding these communities of resistance as resilient subject_s opening an imaginary space for real alternatives, and transforming real spaces for imagining alternatives.

References


**Notes**

1 See also the *Saturday Mothers in Istanbul*, who came together following the example of the *Mothers of Plaza de Mayo*, in 1995-1999 and again since 2009 to raise awareness of state-sponsored violence and militarism and to demand that state-sponsored political murders be brought to light, and the installation of legal rights.


4 From the Invitation Letter, An International Dinner Party to Celebrate Women's Culture, 1979, Archive Suzanne Lacy.

5 Judy Chicago’s monumental sculpture of the Dinner Party, based on women’s collective histories, has raised a significant number of debates within feminism. It was criticized for its essentialism (Griselda Pollock), for excluding women artists of colour (Alice Walker), and for reproducing the model of the master artist (Chadwick). See Chadwick, W. (2012). p. 376. In her 1996 exhibition *Sexual Politics: Judy Chicago's Dinner Party in Feminist Art History* Amelia Jones critically engaged with the complex debates on sexual politics surrounding the work.


7 From the invitation to participate in the first dérive, October 2002, Precarias de la deriva (2004).


9 Lorey (2015), p. 98 quoting Precarias, "De preguntas" in Revista Derive, Approdi et al., *Niciones Communes*, p. 91. She refers to the idea of co-research associated with the Italian workers movement of the 1970s, as well as to practices of consciousness-raising of second-wave feminism (Lorey 2015:92).

Session 12

Co-Production 2
Your Home, My Home:
Lessons in participatory designing with older people

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ABSTRACT Despite the well-acknowledged increase in the population of older people and the UK’s obvious need for housing of all kinds, the provision of housing designed with the needs of older people in mind is especially limited and limiting. Housing directed at such a group tends to be restricted by conservative business models that often treat all occupants as a defined ‘consumer’. Equally, the procurement models employed for ‘affordable’ housing for older people is paternalistic and unimaginative.

Older people are consistently cut out of the discourse on what makes a suitable set of choices for them, and participatory design research that involves older people can help address the shortcomings of a system in which people are treated either as passive consumers of a ‘product’ or as residents on whom housing is imposed by others.

The Dwell Project (Design for Wellbeing in Environments for Later Life, a design research project based at the University of Sheffield’s Department of Architecture) aims to show how the opinions, desires and needs of the older person is key to designing imaginative and appropriate housing for this group. Using evidence gathered from the engagement sessions that lie at the heart of the project, this paper aims to demonstrate the insights that such work can give the designer. Through reflecting on the carefully managed process of brief development, feedback and testing of design options with older participants, the paper aims to explore how design can help develop a set of choices that are more tuned to the needs of older residents in Sheffield. The paper focuses on two aspects of spatial design: first, housing for the downsizer market, demonstrating how providing a wider choice of options for this group of people could stimulate the housing market generally. The second aspect relates to the work we are doing with neighbourhood groups seeking improvements in the public realm that will enable greater mobility for older people. The paper will conclude by making the assertion that housing meeting the needs of older people could set a new standard for all people, no matter what age.

KEYWORDS: Older people, research by design, well-being, participatory design, co-design, age-friendly environments.

Introduction

Evidence consistently shows that older people would like to stay in their own homes as they move towards the end of their lives. They are familiar with their surroundings, close to their friends and feel part of their community. If things are not 100% perfect in their living arrangements as they age, they develop coping strategies that allow them to function
successfully. Yet when the gardening gets too much or the house too difficult to manage, people turn their thoughts to suitable alternatives. It is at this point that they realise their options are narrow because the choice of accommodation that works for them is so limited.

At the present time, older people that have capital tied up in their family home and those with salary-related and index-linked pensions have desires that are not being met by housing providers. Those with few assets or in need of additional care have even fewer options, but they still need appropriate choices if they are to age well independently, as most aspire to do. Indeed the latter group is a key sector, because if they fail to move house into something their assets will cover, they risk falling into social housing, limiting their options, potentially moving where they would not choose to, and depending on the state for their care.

In common with the lack of housing for everyone, housing that specifically addresses the needs of older people has historically fallen into two categories: independent living in a general purpose dwelling or housing that is offered with different forms of care. I am not referring here to Residential Care Homes – in which the individual autonomy of older people is replaced with a form of institutionalised, medicalised environment. Independent or semi-independent housing suited to older people can take the form of sheltered or warden assisted housing or, a fairly recent phenomenon, housing that also provides communal facilities as part of the offer, such as Extracare or Assisted Living (as it is known in the market sector). The communal facilities offered can be limited or quite extensive, but all are designed to encourage socialising and purposeful activity among residents, countering the problems of isolation and promoting wellbeing. The management fee would also probably cover a number of hours’ personal care, to be used as the occupant wishes, and this can be supplemented by additional care as this becomes needed.

In both market and social housing, housing with care is managed housing, subject to a business model which aims to balance service provision with an inevitable service charge. While in both sheltered and Extracare/Assisted Living models each resident has their own front door, the economics of clustering the dwellings and the communal facilities, in combination with insurance, fire and H&S regulations, often lead to designs that encourage residents’ dependency. While some find it reassuring, it is a model that definitely does not appeal to everyone.

When considering typologies of housing suited to the older population the range of accommodation should be very broad; in fact, it should be as broad – if not broader – than general needs housing of all kinds. Older people, just like the rest of us, want a place to call home. It could be a bungalow, a flat, a terraced house, a detached house or a semi. It could be ultra-modern or part of a historic complex. Furthermore, in the current definition of ‘older
people’ we are talking about an age range of perhaps 50 years – from 55 to 105. It is obvious that within this range there is going to be a whole spectrum of needs and desires to address myriad lifestyles, social groupings, cultural and economic preferences, and within this period they might well move several times, requiring different accommodation at different stages. The key to addressing these is the availability of a range of housing options, allowing people to age well, independently but with care if and when needed. While for many this may mean a home built by a provider, a key group of people who are asset rich want something that is not readily available on the market. In the current condition, older people looking to move might typically compete for dwellings that younger people are also attracted to – two- and three-bed homes, often in city centre locations close to services, cultural facilities and transport infrastructure. But is this type of housing sure to work successfully for older people? What are the requirements that differentiate such dwellings from those typically provided for the young?

The imbalance in supply and demand means older people are consistently omitted from the discourse on what makes an appropriate set of choices for them, putting up with unsuitable or undesirable housing choices. Our research has shown that, even nationally-recognised market housing providers with a specialism in housing aimed at older people build homes that break many known, accepted and simple rules for age-embracing living. Often people making the decision to move are buying off plan, cannot read architectural drawings and are not sufficiently informed about what questions to ask. Typically they may be moving under duress, encouraged by family members or under strain from a crisis situation. These conditions are not conducive to making rational, deliberative decisions. In addition, some important features of the dwellings are not legible on plan, such as the stepped threshold into the outdoors witnessed in several flats in an apartment complex we visited. The consequence is that residents only discover the shortcomings once they have moved in and suffer disappointment afterwards. One couple told us that it had taken more than 9 months for them to feel able to call their new dwelling ‘home’.

In market provision, the lack of competition in the sector has meant developers can easily treat their customer satisfaction surveys as token, much less innovate. Meanwhile in the social housing sector, local authorities working at arms length are typically concerned with satisfying numbers, diverting attention from quality to quantity to satisfy statistical forecasting of population growth. Under current procurement systems that eschew risk at all costs, the delivery of housing for older people tends to replicate past models which are then used to test financial viability on the next site. Accordingly, there is little opportunity design innovation. Both these models offer a top-down, generic approach to provision that lacks individual nuance and expression, does not offer new thinking or choice, and there is simply
very little of it. Of special concern is the group of people with few assets and no savings. With very few choices available, this is the group that is in danger of being needlessly ‘rescued’ by the safety net of institutionalised residential care.

The DWELL project and Sheffield

Sheffield is an interesting city, demonstrating economic and social characteristics that match the spectrum across the UK as a whole. With some of the most desirable property in the UK on the edges of the Peak District and some of the most problematic estates, development in the city is polarised: limited by land availability, nimbyism and lack of planning incentives in the expensive areas and by low land values in the poorer quarters. At a strategic level, incentives need putting in place to stimulate the market and make it more attractive for both social and private development of sites in the city. Linking these requirements together is one aspect of DWELL’s work, as we collaborate with the Council to develop their planning policy. Our focus is on developing the Local Plan to reflect Sheffield’s ambitions to become an Age-Friendly City, and suggesting mechanisms for releasing appropriate sites and attracting appropriate developers. These will then form the backdrop to the design propositions investigated by the project.

Participatory design research that involves older people can help address the shortcomings of a system in which people are treated either as passive consumers of a ‘product’ or as residents on whom housing is imposed by business models that consider only the perspective of the provider. Our research aims to work with older residents to engage them in co-design projects aiming to tease out their preferences and concerns in order that they can be re-embedded at the heart of the design process.

The DWELL Project (Design for Wellbeing in Environments for Later Life) aims to show how the opinions, desires and needs of the older person are key to designing housing that provides for the mobility and wellbeing of this group. Using evidence gathered from the engagement sessions that lie at the heart of the project, we aim to demonstrate the insights that such work can give the designer in the delivery of housing that is more appropriate, practical, resilient and uplifting, and that allows them to live well, independently, in housing that suits them. Through reflecting on the carefully managed process of feedback and testing proposals with older participants, the project ultimately aims to show how it can help develop a set of choices that are more tuned to the needs of this group of people.

The DWELL methodology

Our work has identified four neighbourhoods within Sheffield that demonstrate a variety of different spatial, topographical, social and economic conditions. We have recruited groups of
people within these territories and are carrying out a range of engagement projects with them. The strategies employed are, by nature, place-specific, devised to reflect the spatial, historical and social aspects of each neighbourhood, and dependent on the ambitions and capability of the participants involved. These differ widely and our project has had to be responsive to the contingent conditions and differing characteristics of each group as they have emerged.

In all of our work we have been focussing on the aspects of life that improve people’s wellbeing and mobility. We have defined wellbeing as promoting people’s flourishing, by offering ‘meaning’, ‘purpose’ and activity. It is dependent on the interconnections and reciprocity between the self and wider social, cultural, biophysical and spiritual elements. The ‘spaces of well-being’ must provide a balance between an ageing person’s changing competencies and the environment in which s/he lives her/his everyday life. We have defined mobility as the desire for connection with the external world in its myriad conditions, past, present and future, whether this be virtual, sensory or through physical movement in space and time.

**Dore**

The four neighbourhoods have been selected to reflect a typical range of issues found in many British cities, yet they are also typical of Sheffield. One area, Dore, is a former village now absorbed into the city fabric. Still possessing the characteristics of a Peakside village - stone cottages, small scale, old-world atmosphere – it is attractive and affluent, with a high proportion of middle-class inhabitants with life skills, and a high proportion of retirees (33% compared with an average of 19% across the city). Land values are high and there are few sites available for development. There is a strong – perhaps protectionist - local spirit and a fully-constituted Neighbourhood Forum is developing a Neighbourhood Plan. Here we are working with a group that is interested in making public realm improvements to the village centre, redressing the dominance of cars in favour of a more pedestrian-friendly and age-embracing environment. This group has enormous energy and many life and professional skills, and here we are acting as provocateur in helping them to manage their own design process. An exhibition of the design provocations will take place in autumn 2015, with a view to embedding our work within the new planning policy currently being drawn up.

**City Centre**

City wide, we have a group of perhaps 12 participants not allied to any specific area but who are keen to consider the move back into the city centre. With only 17,000 inhabitants the centre is dominated by students and the city council is keen to rebalance this. It has
revived ambitious plans for a city centre plan including shopping and housing, and we are aiming to show how city centre living can and should incorporate provision for the older generation. Here we are co-designing with the participant group, moving through different scales of housing design from internal props, fittings, furniture and storage, through internal organisation and spatial sequences, threshold spaces, groupings of dwellings and building typologies. We have looked at privacy and communality, indoor and outdoor space, the importance of nature and of independence. Our interests have focussed on the down-sizer market – or as we have begun to understand it – the resizer market, for this group of people will typically be looking for 2-3-bed apartments in good locations with company and good access to services, shops and cultural facilities. The results of this are work in progress.

**Parson Cross & Foxhill**

In Parson Cross & Foxhill, a low density inter-war estate to the north of the Don Valley, the issues are very different. Problems of economic poverty are exacerbated by isolation and a poor public realm. People that moved here when it was new are now ageing in place. Parson Cross lacks a clear centre and its fragile identity is being eroded through selective demolition and rebuilding. A huge park sits at its centre but it is not well used. Here the Council are seeking to rebuild areas but in order to attract development the land is given away. It has been hard recruiting participants to our engagement group but have eventually found a few people that have formed around a local history group. It is not clear at present what we will be able to do with this group in terms of design exercises but it is likely that it will spin off from discussions about the historical development of the area, allowing people to contextualise their understanding of the suburb in a perspective that can offer pointers to new narratives for the future.

Consistently our research has found that older people could hold the key to unlocking the housing market if the right product could be made available. In general empty nesters moving out of a family home will make this dwelling available for growing families, helping to solve their housing issues while stimulating sluggish market. We are looking at new models of terrace and mews housing, the remodelling of redundant factories and offices as well as considering housing models that link older people with children and the young, by incorporating nurseries, crèches and other communal facilities within the housing complex. Exploring innovative models of inter-generational (but age-embracing) housing and co-housing involving older people (where groups of like-minded people buy land and design & develop it for themselves) would specifically avoid the older-people’s ghetto and help reduce isolation and counteract the loss of investment in the future that is key to well-being.
Conclusion

As our Advisory Group has pointed out, while it is good at teasing out preferences and gain insights into the lives and thinking of older participants, participatory design has some limitations. Typically people use their experience as a touchstone, so their preferences follow what they already know. The task of the design team is to develop ideas beyond known and accepted types, and innovate, testing proposals in a rigorous manner and showing pathways to new ideas for designs that will address the very limited range that is typically offered as housing models for older people. In the case of a design research project such as this, our work aims to build on what we know already and extrapolate it into new knowledge. We are interested in innovation in both design and the processes that allow good design to flourish. We also recognise that, if the design work is to have impact and relevance to the real world, we need to address the context that will give our work traction. Hence our focus laying the groundwork for appropriate development through advance planning, identification of suitable sites, raising land values and attracting developers to the right areas within the city. Our work on the Local Plan should help facilitate this.

Beyond this we are aware that the procurement process needs consideration, as it is woefully inadequate at drawing out the best propositions. We need to raise the ambitions of the Council ensuring that, even when working through arms-length providers, quality is put first, cemented by credible design review processes and the appointment of good designers with adequate time to do their best work. It is essential to address the briefing process so that it involves older people and local communities at the very front end of the proposal so as to work out what is unique, valuable and essential to giving character to a place. These are difficult things to achieve from within the setting of a University but there are useful guides available, and we are rising to the challenge. As part of our output we are looking to write a manual that aims specifically to join up all the components of a successful process, from planning, site availability, community participation, design, quality and standards, procurement, developer/RP partnerships, to management, aftercare and tenancy arrangements. A key message is that top-down policy is not sufficient to address the specific issues in each community, and this is the value of the participatory design process.
Social Architectures of Community Resilience: 
Sharing and ageing in ‘iconic’ intentional communities

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ABSTRACT This paper explores the intangible qualities of sharing, mutuality and social constructions of ageing that distinguish the inhabited scale of intentional community from conventional streets, rural hamlets and master-planned estates. Previous research on the micro-social practices of intentional community points to the socio-spatial significance of sharing (Jarvis 2011; 2015). The discussion draws on composite ethnographic observations representing three ‘iconic’ intentional communities: Christiania (Denmark); Findhorn ecovillage (Scotland); and Moora Moora (Australia). In different ways each has evolved beyond a purely oppositional enclave to connect internal interests and novel ideas with external support and collaboration. Learning from these enduring sites of experimentation is timely because planners and politicians express growing interest in the role of locally determined place-making. This is evident in the European Charter on shared social responsibility 2011, the UK Sustainable Communities Act 2007, and the Localism Bill 2011. The expectation is that an increased share of collective responsibility yields greater innovation and improved quality of life, not least with respect to an ageing population. The paper seeks to shed light on the intangible processes and attributes of community resilience that formal urban planning typically overlooks. By engaging with a deeper socio-technical understanding of intergenerational sharing, this paper challenges the priority usually given to ‘age-specific’ and ‘design led’ supportive environments. The aim is to recover a purposeful and humanistic scale of association that accounts for intangible (sensory and affective as well as dialogical) network relations in the communities observed. The analysis raises a wider set of issues that we need to think about when considering interdependent phenomena of formal and informal support structures, including opportunities for ‘ageing alternatively’.

KEYWORDS: Intentional communities and cohousing; social architecture; collective learning; sharing economies; community resilience; mutuality; intangible qualities.

Introduction
Western societies are generally characterized by increasing urbanization, ageing populations, and unequal access to housing, transport and local community services. Such characteristics highlight unequal patterns of age-related dependence, health impairments and the way these can be temporarily or permanently exacerbated by changes in the physical and experiential landscape, including the timing and spacing of amenities, networks
and nodes of interaction and belonging, and new construction and policy initiatives. Closer attention to spatial arrangements and qualities of social interaction in residential built environments has stimulated growing interest in age-friendly design and governance.

Corresponding with these concerns are wider trends of political restructuring aimed at shifting power to local citizens and community groups. This is reflected, for example, in the European Charter on shared social responsibility 2011, the UK Sustainable Communities Act 2007, and the Localism Bill 2011. The underlying premise is that shifting power to community groups with collective responsibility for locally defined quality of life objectives will yield greater collaboration, innovation and ‘resilience’.

The concept of community resilience is typically understood as a measure of sustained capacity to utilize locally available resources in order to respond to, withstand and recover from adverse situations. It is usually applied to situations of vulnerability to natural disasters or global financial shocks. Yet, this concept also applies to how well communities function in response to the dramatic demographic changes they experience as their residents age (Scharlach 2012). Growing interest in age-friendly design and governance recognizes the combined significance of civic engagement and community empowerment. According to the World Health Organization, Age-Friendly Communities (AFC) are communities, “where policies, services and structures related to the physical and social environment are designed to support and enable older people … to live in security, enjoy good health and continue to participate fully in society” (Menec et al. 2011). Yet, there is a tendency for age-friendliness to be understood quite narrowly through the specific needs of older people, focusing on physical features of impairment such as wheelchair use, or mental/memory impairment. In critique, a relational view recognizes a continuum of support needs for diverse social groups across all ages. Consequently, it is with the aim of understanding ageing relationally that this paper identifies ‘intentional community’ experiments, notably those balancing inter-generational support needs with expectations of reciprocity, as niche sites of learning. This coincides with political restructuring, including efforts to reinvent local authorities as enabling ‘partners’ in community decision-making.

Intentional communities

Definitions vary but it is widely accepted that intentional communities represent a “group of people who have chosen to live (and sometimes work) together for some common purpose beyond that of tradition, personal relationship or family ties” (Sargisson 2001: 1; Jarvis 2011: 564). Being ‘intentional’ these communities are consciously designed (socially as well as materially), through locally agreed participatory processes, to variously pioneer ecological and sustainable living, personal and cultural transformation, and peaceful social evolution (Jarvis 2015). While intentions vary in strength and focus (and they evolve or
diminish over time) they always have some sense of stated ethos or core values. This is not true of ‘top-down’ or ‘expert-led’ speculative development. Consequently, exploring the inner workings of the intentional community helps shed light on processes of social organizing and the social architectures that function through invisible affective dimensions (of well-being and motivation), inter-relationships (people and place), thinking, learning, practice and performance. It highlights ‘intangible’ qualities of sharing and ageing that distinguish the inhabited scale of intentional community from conventional streets, rural hamlets and master-planned estates. While current debates tend to conceive age-friendly communities instrumentally, the focus adopted here accounts for diverse motivations and informal organizational impetus that tends to be neglected in formal AFC design and governance.

There is considerable variation in the way that the vision and ideals of intentional communities are expressed and experienced in different regions of the world. This reflects discrete historical and political trends of development as well as adaptation to suit particular state regimes of land-use planning and financial regulation. A common feature is that people are motivated to form or join an intentional community because they provide alternative values and possibilities to mainstream society. In this paper, three ‘iconic’ communities are selected as the focus of ethnographic research representing different national regimes: the Danish ‘freetown’ of Christiania; the Scottish ‘spiritual ecovillage’ of the Findhorn Community; and the Australian rural cooperative community of Moora Moora. Each formed in the 1970s and each has since evolved beyond a purely oppositional enclave to connect internal interests and novel ideas with external support and collaboration. The intervening years have seen many changes and challenges, not least that founding members are ageing with the buildings: the introduction of a younger cohort has not always resulted in the intended diversity and harmony of ‘old and young together’.

The remainder of this paper is organised to introduce the scope and aims of a longer paper of the same title. It is not possible to discuss the research findings, methods or mode of analysis in any detail in this outline paper. Instead, the point is to introduce a framework and language through which to shed light on the intangible processes and attributes of community resilience that formal urban planning overlooks. Rather than to seek and scale-up ‘solutions’ for AFCs, the research indicates that more significant insights are to be gained from exploring the processes of collective learning. This is because, as one resident member of Findhorn observes, “(we) face exactly the same issues (as) in the outside world” but in a scale of ‘social experiment’ small enough for “all (members) to have a voice and to look at new ideas and (if necessary) to change things around”.

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A socio-technical and relational transitions approach

To help make sense of the ‘intangible’ qualities and attributes of community resilience it is constructive to draw inspiration from recent academic work on socio-technical regimes and sustainability transitions. Corresponding with this framework is another which views ageing on a continuum of fluid, changing, interdependent age(s) and age-related experience and as the locus for a number of networks of relations: spatial, temporal, economic, social, and technological. From an integrated, relational socio-technical perspective, for instance, the ‘home’ sphere (however culturally conceived) represents a primary ‘anchoring point’ that is at the same time embedded and implicated in multiple intersecting networks – that could also be conceived as infrastructures or capabilities of daily life (Gilroy 2008; Jarvis 2011).

A socio-technical transitions approach offers a more holistic and nuanced way of conceptualizing the impetus of community organizing by taking account of dynamic learning and transformative change. Bergman et al. (2007: 2) locates the lessons to be learned from intentional communities in three dynamic and interdependent socio-technical systems: niche, regime and landscape. The landscape represents the slow changing domain of “world views and paradigms, macro-economy and material infrastructure, as well as the natural environment and demographics” (Bergman et al. 2007: 3). The regime represents the combined structural features and cultural practices that determine property ownership, welfare initiatives and the intended ‘safety nets’ that variously restrict and redistribute access to private and public goods and services. Niche intentional communities comprise groups of actors and methods of building and community organising that are typically at odds with the dominant national regime.

The significance of niche experiments is that they represent a potent seed-bed for innovation and transformative change, both social and technological, which are stifled by the mainstream regime. An ‘empowered niche’ is a niche or aggregate of niches which has grown powerful enough, in terms of resources and support, to challenge (and change) the dominant regime. To be flexible, adaptable (and potentially resilient) the niche tends to remain in a state of haphazard ‘incubation’: in order for co-production and collaboration to facilitate improvisation, experimentation and innovation, it must embrace informal deliberation. This analysis highlights the significant value and intrinsic vulnerability of niche communities- relative to the dominant regime and landscape.

The socio-spatial significance of sharing

Previous research on the micro-social practices of intentional community points to the socio-spatial significance of sharing (Jarvis 2011; 2015). Three types of sharing are observed that distinguish intentional communities from conventional residential communities; physical sharing (space, time etc.) by co-presence; purposeful sharing (collective
governance and agreed goals); and instrumental sharing (reciprocal actions of care and assistance) (Ahrentzen (1996). Each type of sharing involves a complex blend of social and material geographies and a temporal shift – for example from ‘fast capitalism’ to ‘slow democracy’ in recognition that collaboration is a process to be cultivated rather than a product to be ‘achieved’ (Steele 2012; Clark and Teachout 2012).

As one resident of Moora Moora observes: “ideas take time to take hold. We keep the ideas alive through informal discussions over cups of tea and workdays, and raise them again more formally at a community meeting. Circumstances change, people’s perspectives shift, things move slowly and organically. This lived experience of the alternative located within the inescapable mainstream produces an imperative to negotiate different values” (author’s interview data). This observation appears to suggest that formal and informal spheres of planning and organization are co-constitutive. Indeed, this emerges as an enduring theme from the research findings.

The social architecture of physical sharing emphasises a real geography of proximity and embodiment. It is theorised with reference to Ferdinand Tönnies and his correlation of ‘the social’ with intimate small-scale community ‘gemeinschaft’. Richard Sennett (2012, 37) reminds us that, as a contemporary of Tönnies, George Simmel expanded on this scale of social inclusion and belonging, recognising the need for novelty and innovation. Simmel pointed to the universal occurrence in human development of a sociable pleasure in the physical company (co-presence) of others (what he calls Geselligkeit) that could be further deepened through social awareness where this entails a questioning of taken for granted values. This suggests that sociality is not just any social interaction in a bar or café, but a meaningful and challenging dialogue that offers potential for personal growth.

To Simmel, the virtue of sociality is that it can run deep, beyond fleeting impressions (Sennett 2012, 38). This distinguishes the co-present ‘habituated affiliation’ of intentional community with mainstream village-like housing schemes. Not only does the uniform design of speculative development rarely offer the human-scale of clustering required for routine social interaction but there are cultural and institutional barriers to meaningful dialogue and the development of trusting relations necessary for cooperation in shared endeavour.

Cultures of purposeful versus instrumental sharing can be distinguished in terms of what it takes to build and sustain mutuality, what Diane Leafe Christian (2003) refers to as community ‘glue’. She identifies a wide variety of bonding activities, experiences, rituals and dialogue with a strong sense of community: the common denominators are high levels of connection (working together, empathising, negotiating consensus) and commitment (to an agreed purpose). A consensus based process of community decision-making and dispute resolution as well as controls on membership and restrictions on alienation of interests in
private homes (Scott Hunt 2009: 5) are typical across the research. Crucially, all three types of sharing are intertwined and co-constitutive in a process of social phenomenology and dynamic intentions; the landscape of proximity and social mechanisms for reciprocity and exchange are similarly subject not only to personal growth but also highly reflexive deliberations and changing group dynamics (Ahmed 2006).

**Learning from the collaborative process of learning**

Rather than draw out evidence and examples of ‘best practice’ or strategies of AFC, this paper highlights the problem-solving processes common to the intentional communities observed. For example, one key informant explains that there is not an immediate solution to the growing proportion of older people who rely on the Findhorn Foundation for their housing and social security. This issue will continue to be part of a ‘big discussion’ in community meetings for some time to come. She explains that: “collaboration takes a long time. Having been through a lot of these processes (since arriving here in 1985) on a deep level I trust that I have been looked after so far. I have a faith, looking back over my life, and it seems to lead onto the next thing. You kind of feel alive about it, rather than feeling processed, or stuck in a particular stage in life” (author’s interview data).

The residents of Moora Moora are discussing similar issues in their community meetings. Indeed, it featured as the subject of an Australian Broadcasting Company documentary in 2010. In this documentary Moora Moora was suggested to differ from mainstream ‘later life’ housing situations in that it is learning about, and adapting to, ageing in later life through internal processes in a community with adult ages that vary from late 20s to early 80s. These internal processes map onto the complexity of what is in effect not one ‘cooperative entity’ but multiple layers of mutuality and interdependence. On the one hand, this is suggested by capacity for self-built homes to be modified to changing needs (Brenton 2008). Thus, P and S redesigned their house when their adult children moved out, dividing it into two in order to rent one half out to a young family and upgrade the other with ‘lifetime home’ features. Over the longer term they may consider the option of having someone with a nursing or home-help background live in the rental half, to support them at home in later life.) On the other hand, material adaptations only go so far in a community setting built on high expectations of shared labour. S points out that on ‘monthly co-op work days’ she increasingly worries about ‘contributing less and being seen to contribute less’ because she is no longer physically strong enough to chop or stack wood (author’s interview data). Intentional communities are illuminating to explore because they have processes in place to facilitate these big conversations and to render tangible the many intangible costs and benefits that are excluded from mainstream ‘rational economic’ binary thinking on private market and public sector options.
Conclusion: intangible qualities of sharing and ageing

This paper tackles the need to better understand the social and cultural barriers to non-ageist ageing. It does so by focusing on niche intentional community experiments that reveal a setting and system that cultivates an intentional, negotiated ethos of sharing. The more we understand the social mechanics of sharing and mutuality in an intentional setting, the better informed we will be to overcome the wider challenges in urban planning and practice. The shared vision and values that motivate and propel self-organizing projects are largely social and by nature hidden from any simple reading of the material landscape. This highlights what we are missing from the partial picture of design-led material analysis. This is also what distinguishes inhabitants of intentional community from those of ‘master planned’ neo-traditional neighbourhoods (such as the ‘gated’ common interest community).

Until recently, age-related intentional community research, especially that focussing on senior and inter-generational cohousing initiatives, has tended to focus primarily either on design characteristics which promote social interaction (Torres-Antonini 2001; Williams 2005), housing and personal care provision for older people (Scott Hunt 2009), or the political economy of shared property (Sargisson 2010). On the one hand growing interest has increased awareness of the role intentional communities might play in delivering age-friendly resilient communities. On the other hand, a gap remains in our understanding of the social phenomena of mutuality and collaboration in practice.

The longer paper on which this synopsis is based shows age friendliness and resilience to be embedded and emergent: these qualities are not only cultivated from the bottom up but they also evolve in flows of learning, being and doing, as co-constituents of knowledge and empowerment, enacting diverse connected communities of practice around the world. This raises a wider set of issues that we need to think about when considering interdependent patterns of formal and informal association in urban planning and social policy. It suggests that while proximity is necessary for residents to practice sharing, it is not sufficient as a means for mutual support to flourish. This warns against the possibility of engineering ‘mutuality by design’, looking for solutions and taking them out of the context of their collaborative evolution.
References


Provocateurs or Consultants?
The role of Sheffield School of Architecture in the co-production of Castlegate
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ABSTRACT
Communities need support now more than ever to build resilience within their neighbourhoods. To face the challenges of shifting demographics, funding cuts and the alienating processes of development requires a strong sense of community identity and agency.

The UK government’s austerity cuts have not only made communities more vulnerable in the short-term, they are also slicing away the support required to enable communities to weather challenges in the long term. The city of Sheffield has been hit hard by cuts, forcing the City Council (SCC) to reduce spending by 8% between 2013 and 2015. Despite SCC’s priority of “building strong communities”, cuts have hit right at the heart of communities - closing libraries, abolishing community assemblies and tightening many services outside core delivery (Sheffield City Council.2015). As a result, in Sheffield, as elsewhere, public service delivery is changing:

In this context of austerity a new relationship between SCC and Sheffield University School of Architecture (SSoA) is developing. In a neglected city centre area called Castlegate, SSoA is brokering a dialogue between the area’s fragmented communities and SCC.

A community’s ability to exercise control over its built environment plays a key role in its capacity to build resilience in face of an uncertain future. This paper presents co-production as the means by which dialogue can be fostered and control devolved to communities, by exploring how partnerships between SSoA, SCC and local partners have been formed through recent activities in Castlegate. Opportunities and tensions inherent in this relationship are often manifested through questions about the role a university can and should play in building community resilience. Drawing on interviews with students, academics and local partners in Sheffield, the differing priorities, timescales and expectations inherent in this partnership are examined, and suggestions made, so that it might serve as a model for future co-production in urban regeneration. In doing so, the aim is to explore how work produced in academia can maintain its critical pedagogical position while still fulfilling a useful role in facilitating co-production in local communities with, and even on behalf of, local authorities.

KEYWORDS: Live pedagogy; urban regeneration; co-production; creative community engagement.
Introduction

The challenge that the resilience agenda brings to whichever context it is applied is the requirement for new partnerships to be forged in spite of differences in approach and expected outcomes, and across often entrenched divisions between local actors. This paper came about through reflecting on Sheffield School of Architecture’s (SSoA’s) attempts to build resilience in two different contexts: in architectural education and in local communities, through student design projects. Through interviews with students, academics and council officers involved in these projects, this paper seeks to understand and explore the relationships between schools of architecture (and to a certain degree, universities in general) and local councils, in the context of community-based projects.

The Rise of Live Pedagogy

Currently architectural education is undergoing an intense period of reflection and debate within schools, across pedagogical networks and in our professional institutions. Driving this is the need to develop ways in which students of architecture can be equipped to find employment in a rapidly changing profession. Architectural practice is becoming polarised between very large, often interdisciplinary, practices working across many different countries and very small SMEs specialising in highly contextual local projects (Cole.2011). Student debt is rising due to higher tuition fees and the average graduate salary is low considering the extensive training that is required (Mark.2014).

In these uncertain times there is widespread recognition that traditional models of education are not meeting the contemporary challenges of the profession (Hunter.2013). Many architectural educators now see their role as facilitating resilience in students, so that they may take a proactive stance towards the challenges of both the contemporary and a future profession. A resilient architecture student can transfer their skills from one situation to another, partnering excellent design and research skills with the ability to reflect and think critically. These are the skills required to work effectively with existing situations while also questioning, challenging and transforming practice in the future.

A distinct feature of architectural education in recent years is the rise of live pedagogy, evidenced by recent conferences, journal editions and books, notably Architecture Live Projects: Pedagogy into Practice (Harriss and Widder.2014) and Living and Learning, the 2nd AAE conference, Sheffield, 2014. Students working with real clients, learning the practice of architecture through ‘live projects’ has become almost commonplace in schools of architecture in the UK. SSoA has been a pioneer in this field, building a strong reputation over 15 years and we have tested, through both Live Projects (www.liveprojects.org) and Live Studios, the potential for reframing architectural education via collaborations with external partners from the public or third sectors. It is our belief that this teaching method is
well-placed to encourage the skills of resilience in architecture students that are vital for future practice. It has also become clear to us that live pedagogy can also be of great benefit to the community groups that take part in the projects. Critical reflection, self-awareness, the ability to speculate upon futures, a creative attitude to available resources and the ability to communicate priorities and values are all key to a resilient community. These are learning points that are shared across all participants within a live pedagogical situation, students and client groups alike.

However, these projects aren't happening in a vacuum. By undertaking Live Projects that actively build resilience within local communities, SSoA has situated itself as an agent within an on-going context of reduced state responsibility and diminishing public resources. For SSoA to continue to build resilience both for its students and the wider community, its, and to a wider extend the university's, relationship with local partners, is one that needs to be understood and carefully negotiated.

The Wider Political Context

At SSoA, as we track our partnerships over time, we become aware of the shifting context of funding and resourcing of our external partners. The long-term political trends that have over the last 30 years seen successive UK and western governments relinquish control of public services to market-led forces and the priorities of the individual have had a profound effect, not only on core services such as health and education, but also on the services that govern our built environment.

On the face of it, recent moves that have seen urban planning and community support opened up to greater input from individuals and non-public bodies has the potential for these services to become more flexible, and user driven, in their design and delivery. But while there is clear potential to improve service delivery, these aspects are resourced in a way that does little to encourage creativity and initiative at a community level (Whitfield.2012).

In the UK this agenda has been pursued by the coalition government under the Localism Act, which, via the Neighbourhood Planning Policy Framework (NPPF), has aspired to a far greater involvement of community and third sector organisations in the planning and design of the built environment. Yet in a review of Localism policy, Matt Padley of the Centre for Research in Social Policy at Loughborough University (2013) notes a universal lack of clarity in the “articulation and application” of the concept. While on the face of it Localism proposes to “release councils and communities from the grip of central government” (Department for Communities and Local Government.2011a in Padley.2013:343), “encouraging local autonomy and flexibility” (HM Treasury and Cabinet Office.2004 in Padley.2013:343) and “empowering communities to do things their own way” (Department for Communities and
Local Government.2011b in Padley.2013:343), this is a seemingly impossible task given the austerity cuts to public spending inflicted on local authorities. The result has been a scaling back of central responsibility in planning and urban development, without the necessary provision of support to enable control to be picked up at a local level.

In addressing the need to “move beyond rhetoric and broad brush strokes to meaningfully work with individuals, groups and communities” (Padley.2013:351), there is growing acknowledgement of co-production as a method of application. Noting this “potentially creative” yet “dangerous” moment in the reform of public service provision, Boyle and Harris’ paper The Challenge of Co-production (2009) offers a comprehensive starting point for local authorities, public and third sector organisations and professional bodies to form mutual working partnerships.

“The time seems to have arrived for the idea that the users of public services are an immense hidden resource which can be used to transform services – and to strengthen their neighbourhoods at the same time.” (Boyle and Harris.2009:3)

Fundamentally, co-production questions the divisions existing between departments, sectors and institutions, pushing for “mutual exchange” across long standing boundaries (Boyle and Harris.2009). When the concept is discussed in relation to urban regeneration and the design of the built environment, the need to broker a dialogue between local authorities and the local community, particularly those factions that are underserved by current levels of community support, becomes hugely important. Within Sheffield, this role of broker between local authority and the public is one that, as a result of 15 years practicing live pedagogy in the city, SSoA is now beginning to occupy. This has led to numerous short-term collaborations between SSoA and Sheffield City Council (SCC), but in order for this partnership to build the resilience of local communities and architecture students in Sheffield (and serve as a possible model of future co-production in the city), further understanding of this relationship is required.

To this end, this paper will address the following questions: How has the already successful relationship between SSoA and SCC been formed through recent activities in Castlegate? And, what are the fundamental conflicts that need to be addressed if this partnership is to serve as a model for co-production in urban regeneration?

**Evolving Partnerships in Sheffield**

*Introducing the primary research*

In order to better understand the relationship between SSoA (within The University of Sheffield (TUoS)) and SCC, interviews were carried out with individuals from each institution involved in our case study: Vanessa Toulmin (VT), Director of City and Cultural Engagement at TUoS; Simon Ogden (SO), Head of City Regeneration at SCC; Sally Cuckney (SC),
Development Officer working within the City Regeneration team at SCC whilst under the direction and employment of Vanessa Toulmin at TUoS; and four Masters of Architecture students (MArch) currently studying at SSoA. By unpicking the complex relationships apparent in this case-study we can begin to speculate about the opportunities and challenges inherent more widely in partnerships between academia and external partners, in particular local authorities, within the precarious context of urban regeneration. What are the understandings and compromises that need to be established to make these relationships work well for students, academics, external partners and local communities?

A strategic partnership

“Fundamental and rapid changes in government policy herald a more market based approach to universities... Faced with a time of undoubted transition, we need to remind ourselves and others what a university is for – who benefits from our work, our research and excellence in teaching?”

(Prof Keith Burnett, Vice Chancellor at TUoS.2011).

UK universities are not immune to the challenges of neoliberalism and austerity, and in recent years TUoS has seen fundamental changes to its structure, role and capacity, both globally and within Sheffield itself. The result is the university’s own need to create resilience through the formation of local partnerships, at a time when the need for SCC to “fill in the gaps” in public services is increasing (VT.2015).

When the University of Sheffield was founded in 1905 with penny donations from the city’s factory workers, the aim was to provide higher education for the city’s children. This strong connection between the University and the City has recently been given renewed energy and meaning through the ‘Engaged University’, an initiative headed by Vanessa Toulmin to deliver “noticeable change in the city” (VT.2015). As a result there is now a concerted effort to build relationships with local partners and to understand how these local roots can be relevant to a university that produces internationally recognised research and teaching.

Working closely with Sheffield’s communities, businesses and public institutions has enabled academics and students to understand the complexities of working on the ground in local situations. Being “confronted with realistic problems” and critically reflecting on the “direct consequences” of their decisions, SSoA students build resilience to their practice by being introduced to “more rigorous, more useful and more realistic” scenarios (MArch.2015). In turn, at a time when “it feels like the council are running dry” (MArch.2015) often “making very big decisions based on very thin evidence and research”, an under-resourced SCC are given access to “greater intellectual power” (SO.2015) through the
“sharing [of] skills and swapping [of] resources” (SC.2015). The result is that the communities involved are provided with a far greater level of support and input than would have been previously possible.

The project at the centre of this new strategic partnership is the regeneration of the Castlegate area in Sheffield, and it is here that the nuances, benefits and conflicts of working across traditionally entrenched institutional lines are becoming apparent.

Case Study – Remake Castlegate

Castlegate lies at the northern edge of Sheffield’s city centre, now somewhat removed from the concentration of activity in the busy shopping streets and public spaces to the south. Historically, however, Castlegate was the birthplace of Sheffield and for many centuries the centre of the city. Despite the ruination of the castle and the building of the new Town Hall elsewhere, Castlegate continued to hold a vital role as the centre for market trade in the city, serving in particular the working-class neighbourhoods of northern Sheffield, supported by the construction of Castle Market in 1959.

In the last 20 years however the fortunes of the area have declined sharply due to shifts in shopping habits, lack of investment and the city council’s strategic planning decision to open a new market to the south of the city centre. In March this year, the demolition of Castle Market started, bringing to an end 800 years of markets on that site. Castlegate’s rich social and architectural history, its current state and its uncertain future make the area a fascinating opportunity for “on-the-ground teaching and research” (SC.2015). As a result, SCC is now collaborating in the shaping of the area’s future with TUoS departments of landscape, history, archaeology, and, the focus of this paper, the School of Architecture.

Fig. 1. Community groups contribute to a co-produced vision of Castlegate.
In 2014/15 SSoA based two Live Projects and two masters design studios in Castlegate. With 60 students working throughout the year, dedicating in total about 3000 days of research and design to the area, and with council consultation budgets slashed, “any way [SSoA] can supplement that is valuable” (SO.2015). Through on-going creative participatory design and research (see fig.1), the students are producing material that is deeply situated in the area and closely reflects the anxieties, hopes and dreams of local people (see fig.2). Even pre-austerity, this level of long-term, creative and responsive community participation was beyond a local council’s capacity.

The aim of SSoA’s work is to lay the groundwork for a co-produced Castlegate, where the future of the area evolves through the close involvement of its citizens. At its heart this will rely on a culture of mutual exchange between SCC and the area’s resident, business and community groups, something the TUoS is keen to act as “honest broker” (VT.2015), and which SSoA is in an excellent position to support urban regeneration through student involvement. The following section draws on our and the interviewees’ experiences in Castlegate and discusses the nature of this relationship, shaped and tested as it is, by differing priorities, timescales and expectation of outcomes. In doing so we will explore how work produced in academia can maintain its critical pedagogical position while still fulfilling a useful role in local communities, with, and even on behalf of, local authorities.
Solutions, Conflicts and Managing Differences

The evolving “lively and productive” (SO.2015) partnership between TUoS/SSoA and SCC in Castlegate has begun to set the tone for a more long-term collaboration between the two institutions. In addressing the first research question - How has the relationship between SSoA and SCC developed through recent activities in Castlegate? - the case study has shown this to be the result of organic individual relationships and mutual exchange between institutions.

While a stronger partnership is prioritised at senior management level within both institutions, its success is reliant on individual, non-formalised and “organic” relationships (SO.2015). Indeed, Sally Cuckney accredits the drive for a long-term partnership between the two institutions to “smaller success stories”, individual projects and the result of “people being forced to think more creatively”, that has “built bridges” over time (SC.2015). It is important to speculate how these fluid and “reactive” instances of “the right people talking at the right time” (SO.2015) can be valued and encouraged within a strategic and largely top-down approach from both institutions.

There is also clear evidence of SSoA and SCC beginning to form a partnership based on mutual exchange. For SCC, the benefits of student involvement in bringing “intellectual input” in the form of “new ideas, imagination [and] critique” to the urban regeneration process is something that is made explicit by both TUoS and SCC (VT and SO.2015). Another interesting outcome of student involvement in the consultation process, adding weight to the university being an “honest broker” (VT.2015), is the nature of the relationships formed between students and local stakeholders. “If you say you’re a student people want to talk to you...you’ve got more of an opportunity to be a bit cheekier [than the council] and ask a lot more and push the boundaries” (MArch.2015). The value of more candid engagement between the students and the public was also picked up on by SC (2015), remarking on the ways in which student involvement “worked wonders” for gaining insight into the opinions of stakeholder groups. However while the role of students as catalyst or broker is widely acknowledged, beyond the initial stages of ideas and consultation, their work becomes more challenging to implement.

Similarly for the SSoA students, the value of working with external groups, identified primarily as the acquisition of inter-personal skills that cannot be learnt in a the traditional academic setting, was acknowledged as being “extremely beneficial”, corroborating the live pedagogy agenda from SSoA (March.2015). Yet a comment from the MArch students working in Castlegate was that, while it “felt like [their] ideas held some traction and was going to make an impact”, due to the freedom afforded to them to “push the boundaries”, their work risked not informing the reality of the formal development process and thus, the potential impact of their work was limited (2015).
For the regeneration of Castlegate to be supported by a mutual partnership between SSoA and SCC, and for this to serve as a model for co-production in urban regeneration, two major conflicts, recognised by all interviewees, need to be addressed.

The first of these has to do with the timescales at which each institution operate. “The council and the university march to slightly different drums” (SO.2015). While at a strategic level TUoS is committed to partnering in the long-term regeneration of Castlegate, with Vanessa Toulmin (2015) acknowledging the project as “a whole generational rechange”, with student projects lasting no more than a few months, building continuity in the long-term becomes difficult. “There is a limit to the impact a year’s [student] work is going to have unless it’s part of a programme that each year of students contributes to” (SO.2015).

The collaborative regeneration being embarked on in Castlegate will take time, but when “students aren’t physically there for long enough” to work on the project from start to finish, it becomes very difficult to “keep up momentum” (MArch.2015). When student input is “time restrictive” and the process requires ideas that are “deliverable and practical” (SC.2015), the only options appear to be for SCC to resource a project once a student has left, or for SSoA to persuade next year’s students to pick up where their predecessors left off.

The second challenge to be addressed in order to fully exploit this partnership has to do with differences in the product and expected outcomes of each institution. “I think the practicalities of delivery are on different pages” (SC.2015). The critical, provocative and exploratory process that is essential to the pedagogical process provides students at SSoA with the freedom to make propositions within the parameters that SCC operates. “We develop our own narratives which aren’t always relevant” (MArch.2015). This however has clear difficulties when an external partner is hoping for clear deliverable outcomes. Within the learning experience there should be possibilities for conjecture, risk and accident and that doesn’t necessarily map against an instrumental process of problem and solution.

Conclusion – Building resilient partnerships

The partnership between SSoA and SCC and the public in Castlegate has highlighted the potential for co-production to build resilience in local communities, by supporting individuals to form personal relationships across traditional barriers, and encouraging one of mutual exchange between academia and local government. They have also revealed two fundamental conflicts, where differing timescales and expectations of outcome have meant that the full impact of these partnerships in building local resilience can be compromised.

Co-production requires long term and creative commitment to an area from all stakeholders. In times of austerity the capacity for universities to focus their resources on a particular area and its communities in the long-term, has been shown to be an
extraordinarily valuable resource for public service providers. An hesitancy to do so however is understandable, and stems from the perceived risk that this resource becomes moulded into existing protocols of service provision, rather than a partnership of mutual exchange.

Student work can play a key role in building local resilience; through the production of rigorous quantitative and qualitative research, the delivery of live projects and the raising of ambition and debate through hypothetical design proposals. An important conclusion to be drawn is that, if this partnership is to be exploited to its full potential, “the student’s work should be better curated” (VT.2015) to enable long-term objectives to be addressed through short-term student involvement - to “synchronise the drum beats” (SO.2015) between the two institutions.

Our research also shows that there can be mutual respect and appreciation for the often contradictory expectations of outcome from academia and local government. Critique and academic enquiry, even provocation, is certainly valued by SCC, as long as it is partnered with proposition: “Yes, ask difficult questions but also suggest some answers” (SO.2015). It is the requirement to be provocative and propositional that makes architecture students especially well placed to help shape the future of an area in partnership with its communities, so long as the differences that exist are transparent and understood between all partners.

It is important to accept these differences, and to understand that a successful partnership does not need to be perfectly symbiotic - “there is always an element of risk but that’s what it’s about” (VT.2015). Learning how to shape a dialogue that acknowledges and respects differences in operating practices, while maximising the potential of all participants is a key skill for students, citizens and institutions alike. Achieving this dialogical process of co-production has been shown to be a complex and nuanced process, but one that can begin to build self-knowledge, resilience and the capacity to transform not just a part of a city, but even the institutions themselves.
References


Session 13

Low Carbon Living in Cities
ABSTRACT Based on classic literatures which testify to the relevance of post-occupancy evaluation (POE), and state the importance of knowledge of these results used in the making of short, mid and long term decisions in the design and construction of buildings, this study discusses new methodological possibilities for the area. The objective is to develop methodological procedures for functional and behavioral post occupancy evaluation in apartment buildings, through the development of specific software and the utilization of digital interfaces. The study aims to make the POE process in housing more efficient, through the use of electronic equipment (laptops, tablets, PDAs), presenting reflections and discussing the possible interfaces that can be used between humans and computers, Human-Computer Interactions (HCI), in the area of POE research; establishing three concepts to obtain this relationship: usability, applicability, communicability. The digital media resource aims at minimizing if not eradicating reoccurring problems in traditional POE, insofar as increasing the efficiency of evaluation results, reducing the execution time and budget costs, as well as triggering a wider interest on the part of respondents. The results of this study look to contribute to the current debate on the production of quality apartment buildings since the objective is the more efficient POEs and the availability of results as much for society, as the agents in the real estate market. This research also points out the capability of such proposed mechanisms to increase the resilience of housing and population by obtaining data and information about living, culture and places.

KEYWORDS: Post-occupancy evaluation; apartment; human-computer interaction (HCI).

Introduction

Based on classic literatures, such as those from Preiser, Rabinowicz and White (1988), Ornstein, Bruna and Roméro (1995), Vischer (2001) and Mallory-Hill, Preiser, Watson (2012), that testify to the relevance of Post-occupancy evaluation (POE) and state the importance of knowledge of these results used in the making of short, mid and long term decisions in the project and construction, this study intends to extend the discussion on new methodological possibilities in the area of evaluation application. Interdisciplinarity, the adoption of different methods and non-traditional approaches, are the principal focal points of this discussion.
Interdisciplinarity justifies itself insofar as other sciences, apart from those related to Architecture and Urbanism, are relevant to the broader grounds of planned action in POE (Ornstein, 2005). Environmental psychology, anthropology and philosophy are the most relevant areas to functional and behavioral POE of housing spaces. The adoption of multiple methods in POE, qualitative and quantitative, has allowed the collection of different types of data allowing, especially, the counterbalance of the possible deviations and tendencies (bias) of results (Lay and Reis, 2005; Zimring, 2001; Bordass, Leaman and Eley, 2006). Finally finding evaluation methodologies with non-conventional approaches, which consider other evaluative components which are not, properly, physical measurements of the constructed environment, but deal with different perceptions and characteristics which interfere in the behavior of the users (Elali and Veloso, 2004; Rheingantz, 2004).

The grounds presented above aimed at the development of methodological procedures in functional and behavioral POE in apartment buildings through the design and utilization of digital interfaces. The study intended to make the POE process in housing more efficient, through the use of electronic equipment (laptops, tablets, PDAs), presenting reflections and discussing the possible interfaces that can be used between humans and computers, in the area of POE research, establishing three concepts to obtain this relationship: usability, applicability, communicability.

This research also points out the capability of such proposed mechanisms to increase the resilience of housing and population by obtaining data and information about living, culture and places. The concept of resilience, which can be understood as the capability of adaptation or the faculty of recovering, is viewed in this research as an important measure to achieve the adequation and quality of the dwellings. The traditional concept of resilience is associated to the capacity of a system to absorb disorders and reorganize itself when subjected to changes, and at the same time being able to keep its essential functions, structure, identity and mechanisms (Walker et al., 2004; Thackara, 2008). This concept has been recently used to refer to the capability of the recovery of natural systems after deep and extreme changes. However, this meaning has also been applied in other fields such as human relations and urban dynamics.

Related to the term resilience, this research points out three highlights: (i) Establishing efficient databases on housing, focusing on the ways of living of the inhabitants, and also on building performance; (ii) The knowledge obtained from POEs could feed and contribute to the accuracy of the building design, especially considering the discussion about built environment and the resilience of inhabitants; (iii) The access that inhabitants have to information on the evaluative process increase their critic capability thus also developing their skills to adapt themselves to the built environment.
The work methodology was based on the following stages: (i) bibliographical research on POE and possible digital interfaces; (ii) research and development of software, platforms and equipment ideal for the research objectives; (iii) definition of methodological procedures of POE in apartment buildings with a focus on function and behavior; (iv) development of functional prototypes – software suites; (v) choice of case study in the city of Uberlandia, Minas Gerais, Brazil; (vi) Application and analysis of results; (vii) adjustments to software, and development of a definitive method of POE from the results; (viii) respective forwarding to future studies.

The main objectives of the related research are: (i) to make the process of POE in housing more efficient through the use of electronic equipment (laptop, tablet, personal digital assistants); (ii) present reflections on the utilization of digital instruments for POE research; (iii) to discuss the HCI possibilities in the area of POE research; (iv) to develop functional prototypes and a platform (composed of different integrated, complementary software) compatible with the proposed POE objectives.

**Grounds: Why Digital Interface in POE?**

The relevance of POE in the obtaining of architectural project quality has already been overwhelmingly consolidated by diverse research in the area of civil construction (Elali and Veloso, 2006; Ornstein, Villa and Ono, 2010; Villa and Ornstein, 2013). Relevant aspects in relation to the management of the project process, in which POE inserts itself and its role in the achievement of quality of constructed spaces, notably in housing, have also been amply studied (Melhado, 2004; Silva and Souza, 2003; Adesse and Salgado, 2006; Villa, 2008). This evidences the necessity for a close, deep, relationship between the gauging of human behavior in domestic spaces and the housing quality as a way of elevating the satisfaction indexes and the improvement of performance from idealized projects in this area. This improvement, in addition to other aspects, also involves the construction and observation of databases fed by the post-occupancy evaluation, by architects, that include physical perception techniques of the built environment, as well as the interaction between this environment and the behavior of users (Villa, 2009; Villa, Ornstein, 2010).

The search for methodological improvements through the use of portable equipment came about specifically due to an investigation on the main methodological advances in the area of POE, in which it was identified that the majority of research executed in Brazil was restricted to the use of traditional resources in the application of techniques such as paper questionnaires, and even when studies do use specific software to apply surveys, being net-based or not, they involve low levels of user interaction. The use of technology is often restricted to the use of
electronic equipment such as cameras, recorders and performance measuring devices, complementing the application of the techniques and/or obtaining of data from the study case.

From previous research on POE in housings (Villa, 2008, Villa e Silva, 2012); various demands were inductive questions in the development of research: (i) increase of efficiency and reliability of results from evaluations obtained through quantitative methods; (ii) maintaining privacy of the subject habitants; (iii) the possibility of more interaction between the researcher and the habitant during the evaluation; (iv) reduction of costs in the evaluation; (v) increasing efficiency in analysis of results from the evaluation; (vi) graphic and multimedia capacity, digitally potentializing interactions; (vii) use of technology, not only in terms of equipment, but being a functional and integral part of the evaluative process; (viii) capacity for the evaluation to become educational.

The previously mentioned issues look at integrating the use of digital media with the intention of suppressing, or minimizing the identified deficiencies and problems, potentializing the evaluation methods and obtaining more efficiency in results. According to Coates, Arayici and Ozturk (2012), the influence of technology on the world has been growing, and it is quite normal to also cover living spaces. Moreover, the worry about the way we live has been greatly accentuated by project demands and the question of environmental sustainability. Uniting these two problems, digital technology can aid in the development of POE, embracing further topics and making a more complete and efficient evaluation possible.

The interface for POE application can be improved based on HCI (Human-Computer Interaction) approach, a term which designates the intermingling of humans with digital machinery (Barbosa and Silva, 2010). The interaction between users and computer systems differentiate themselves from conventional machine interfaces by demanding, from the users, more cognitive effort in the interpretation and operation of the information processed by the system (Norman, 1986). The construction of this interface aims to satisfy the question of “user-friendliness”: The system must appear friendly in relation to the user.

According to Souza (1999), in HCI, this friendliness can be understood using three concepts: (i) usability: refers to the ease of use (physical and cognitive effort), the learning of the operations present on the system and the level of user satisfaction during use; (ii) applicability: for Fisher (1998) the designer must also strive for applicability, in other words, the use of the system in the solving of problems, resulting in a software application that should serve the specialty of the user; (iii) communicability: the way the system communicates to the user, the principles and intentions of interactions that guide its design. The goal of communicability is to enable the user, when interacting with the application, to understand the premises, intentions and decisions of the designer during the elaboration of the interface. According to HCI, an application that allows the user to better understand the logic of the
designer can provide a more creative, efficient and productive experience (Preece, Rogers and Sharp, 2005).

**Tool Design and Application**

The utilization of digital media in POE has brought a discussion on its structure and planning. In order to comply with the interests sought in the new, digital application, three parallel approaches have been developed in the study: (i) structural adequacy of POE techniques; (ii) Development of computer system frameworks and (iii) design and interface.

For the structural adequacy of techniques, some keywords were identified and classified in four groups of main affinities: environment, room, attribute and issue. From these four groups, a web of interlinked words, which abandon the linearity of the traditional method, giving a more sequential, three-dimensional aspect to these actions, adequate for a digital environment was created.

On the development of the computer system framework, this research was centered in solving the following points: (i) the construction of open software, passive to change, since POE is a dynamic methodology in which each study object requires alterations in its methodological procedures; (ii) the design and programming of different level of interaction: between the user and the application on the tablet; between this application and the “intermediary” software; between the intermediary software and the database; (iii) the establishment of systematic, interconnected, web-based platforms for databases; (iv) interconnected and dynamic data analysis systems to relate the obtained results (data crossroads). From these definitions, a system framework design was defined to achieve the proposed objectives in the research using Java programming language, SQL database language, and the tablet application would be programmed using Unity 3D engine. The development of the application faced issues in structure, function, operation and the interface used. The design of the interface was idealized in the most intuitive way, providing certain freedom in the course chosen by the interviewee. This was achieved considering: (i) the maximum concentration of possible keywords on one single screen; (ii) the use of symbols, colors and animations, representing the various keywords; (iii) the use of multimedia resources for these animations; and (iv) the availability of varied information and data about attributes (keywords) evaluated for placing the user in the context of the research.

The strategies presented here aim to include the users (architect and interviewee) in the creation process, actively taking part in the design of the interface. The production of the interface was based on the previously mentioned flowchart and on a preliminary design document containing the scenery idea, concept, screenplay, feature list, and storyboards. For instance, the storyboards construction was carried out in the phases: (i) structuring of the
evaluative attributes – sequence of possible actions and relations between elements; (ii) the design of the main scene, graphic elements, icons and symbols; (iii) application of a pre-test with the users (architects and interviewees) and the revision of the graphical elements and sequence of events; (iv) development of final interface in phases – scenarios (Fig. 1).

Fig. 1. Evolution of the storyboard – different scenarios were tested to reach research objectives.

During the design document elaboration, studies were carried out to identify the friendliest interfaces to the users’ profile, both in regard to the esthetic and functional aspects (colors, textures, symbols and reading direction, command types, sound). This was discovered through consolidated research in the area of human behavior (Bechtel, Churchman, 2001; Sanoff, 1991; Sommer, Sommer, 1997) and the convergence with other areas of knowledge such as interaction design (Preece, Rogers and Sharp, 2005). The interface improvement occurred gradually from the consultation of the community and the achievement of the inductive objectives and research demands (Fig. 2).

After the development of the previously described stages of research, with the software suite and interface both defined, the planning started with the categorical application of the method, following the stages: (i) definition of the case study; (ii) definition of the instruments utilized; (iii) definition of sampling; (iv) contacts and authorizations; (v) application of instruments; (vi) analysis and recording of results; and (vii) indications for future research.

The deployment was chosen for presenting a series of relevant characteristics in the sense of potentializing the application of the method. The eastern sector of the city of Uberlandia, state of Minas Gerais in Brazil, is characterized by vertical, collective housing, composed of 17 blocks and three different typologies of apartment: two and three bedroom, with or without suite (57.00 to 84.00 m²), with communal equipment (pool, gym, party area, sports area, toy library and playground).
Methodological procedures utilized were defined by the choice of study object, the methods and instruments, in which the majority was applied by means of digital media, specifically tablet (Table 1). The software suite developed for the tablet for this study contemplated the instruments: walkthrough, family profile survey, key-person interview and the questionnaire + use analysis. As the principal objective of this application was to test the method on digital media, a significant sample was adopted according to the following aspects of the deployment and its population: (i) variation of typology of the habitational unit; (ii) variation of family profile of the interviewee; (iii) variation of age band of the interviewee. These aspects could give a larger variety to the sample, amplifying the demands in the application of the instruments.
Table 1. Instruments listed for the case study and its characteristics.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Survey of General Data</td>
<td>Researcher</td>
<td>qualitative/quantitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Walkthrough</td>
<td>Researcher</td>
<td>quantitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Study of family profiles</td>
<td>Doorman</td>
<td>quantitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Questionnaire + Use Analysis</td>
<td>Habitant</td>
<td>quantitative</td>
<td></td>
<td></td>
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<tr>
<td>5. Focal Group</td>
<td>Habitant</td>
<td>qualitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Interview with key-people</td>
<td>Architect and Apart. Manager</td>
<td>qualitative</td>
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</tbody>
</table>

After attaining the contacts and due authorization from the responsible agents for the condominium (Apartment manager and council), the instruments were applied in conformity with the sequence established in table 1. During the application of the instruments by digital media, records were taken by the interviewers in order to identify possible problems and positive aspects in relation to: (i) functioning of equipment and system; (ii) level of man-machine interaction - interface; (iii) comprehension of the terms and information collected; and (iv) optimization of time. The points of view collected were tested for compatibility against each group of samples (family profile, age band and typology) to potentialize the reflections on the evaluation method tested (Table 2).

Table 2. Evaluation of the performance of the questionnaire applied on digital tablet according to the categorization proposed.

<table>
<thead>
<tr>
<th>Evaluation Scale</th>
<th>Functioning of the equipment/system</th>
<th>HCI interface level</th>
<th>Comprehension of terms/ information</th>
<th>Optimization of time</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAMILY PROFILE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core family</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childless couple</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single habitant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-35 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>36-60 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 61 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 bedrooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 bedrooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation Scale</td>
<td>TERRIBLE</td>
<td>BAD</td>
<td>GOOD</td>
<td>GREAT</td>
</tr>
</tbody>
</table>

Analyzing the results from the application of all instruments listed in Table 1, led to further analyses being carried out to verify the efficiency of the instruments elaborated on the digital media, notably on the questionnaire. It was verified that the results listed in the questionnaire graph, in the majority of cases, matched the general opinions of the habitants listed by the Focal Group and also by the researchers on the walkthrough. Issues like, dissatisfaction in relation to the unit (apartment) in the questions on usable area and quality of finishing are confirmed in all of the instruments applied, much the same as the highest levels of satisfaction data management in the condominium, and the question on cleanliness and maintenance. After the crossing of the results attained from the application of all instruments, reflections were made in order to improve the software suite developed. Such reflections could feed the delineation for the continuity of this research (Table 2). Some problems were detected with the
use of the tablet, in terms of functionality and the comprehension of information and terms evaluated, although this information was easily clarified by the end of the research. However, larger problems were found in relation to the HCI interface, as shown in Table 2.

**Conclusion**

The results from this research look to contribute to the methodological advances in POE of apartment buildings through the development of digital interfaces. The digital media resource aims at minimizing if not eradicating reoccurring problems in traditional POE, insofar as intending to increase the efficiency of the results from the evaluation, providing more objective, interactive graphic resources, triggering an increased interest on the part of the respondents and consequently guaranteeing results which are more representative of reality.

Designing an apartment building with a major degree of resilience means to start the design process, carefully thinking of the typical scenarios of utilization of such a building, like common stress points due to the current use, the way of living as well as the social and cultural aspects. Thus, the localization (In opposition to the globalization) plays an important role in the determination of the factors making the building more or less resilient. Easier to apply than traditional methods of POE; the digital means and the HCI interaction, allows more accuracy in the collected data besides a more frequent updates of the responses. These HCI methods, therefore, can significantly contribute to increase the resilience of built environment since this leads to a higher specification and assertion of the data in a community localization.

The strategies presented here look to bring the users (architect and interviewee) into the creation process, actively taking part in the design interface. We understand that the design of digital interfaces with the participation of the users can be an alternative to homogenizing bias presented by the majority of digital inclusion policies, in which the utilization of such digital media is restricted to the instrumentalization of users, treating them as simply operators of already consolidated software.

Apart from the specificities involved in POE research, it is fitting to reiterate the interdisciplinary character of this endeavor. The coordination of strategies that promoted the collaborative creation, between different areas (architecture, computation and design), of the prototype was a learning curve in itself. Although having tried to anticipate how this collaboration would be through the use of indications, it was during the execution phase of the project itself that we could have acted with more clarity towards the challenges of the convergence between areas. We conclude that this process was not just the execution of tasks and specific demands in one area or another. In one considerable portion of the project, the tasks being carried out were established in conjunction, by both areas. We understand that we
have managed to pass from initial multidisciplinarity to interdisciplinarity, establishing common ground where questions were identified and reaching eventual solutions.

Based on the previously mentioned reflections, it is evident that the necessity of the close, deep relationship between the gauging of human behavior in domestic spaces and the habitational quality as a way of raising the index of satisfaction and improving the performance of projects in this area. This improvement also involves the construction and observation of databases fed by the post-occupancy evaluation, by architects, that include ever more efficient physical perception techniques of the built environment, as well as the interaction between this environment and the behavior of users.

Acknowledgements
Thanks to funding bodies of this research FAPEMIG – Foundation for Research Minas Gerais, CNPq – National Council for Scientific and Technological Development, CAPES – Coordination for higher Education Staff Development and PROPP/UFU - Dean of Research and Post Graduate Studies of Federal University of Uberlandia, Brazil.

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Notes

1 The team that applied the POE was composed of 12 full-time students from students from both course of Architecture and Urbanism, and Design. Preceding application of POE the team was trained and prepared in the use of the tablet.
Technical and Social Redundancy
for Low Carbon Living

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ABSTRACT Buildings and communities need to be more resilient in the face of unknown and unpredictable effects of climate change, economic crises and resource depletion. This paper defines resilient design in socio-eco-systemic terms and aims to identify the redundancy (ability to switch between numerous available choices beyond optimal design) of available means and methods in housing and home environments in order to prevent performance failure either in unexpected circumstances or in response to varying user needs, working with climate change. Redundancy analysis covers; technologies, fabric and systems interrelated with social aspects and the extra capacities of a housing community compared to an individual trying to keep control of internal environment.

This one year UK case study of the LILAC award winning co-housing development in Leeds, UK, focuses specifically on the environmental redundancy available in ventilation and heating systems. Social redundancy is then linked with capacity to share resources and ideas and to learn collectively. Analysis includes environmental and community engagement and comfort expectations. Results obtained through a wide variety of building performance evaluation methods interrelated with action research indicate the benefits of introducing extra redundancy in housing design and community development to accommodate varied user preferences, increase energy savings and cope with unexpected failures. Recommendations include better understanding of cost factor of time or monetary contribution needed to implement social or technical redundancy. These costs should be evaluated in context of savings made through greater resilience achieved. The paper is particularly aimed at architects, engineers, quantity surveyors, housing developers, built environment researchers and educators.

KEYWORDS: Resilience; housing; community; collective learning; technologies; home.

Introduction

The latest contribution to the Intergovernmental Panel on Climate Change’s fifth assessment report (IPCC, 2014) confirms the virtual certainty of more frequent hot and fewer cold temperature extremes, increased heat waves, occasional cold winter extremes, and significantly increased precipitation. These increasing extremes are already generating significant increases in flooding, storms, wind speeds as well as new temperature records. Buildings and communities need to be more resilient in the face of unknown and
unpredictable effects of climate change, economic crises and resource depletion. Current plans of mitigation and adaptation need more development in terms of developing design capacities to cope with unpredictable events. This paper combines social and physical analysis in order to understand more about the necessary capacities that we need to develop to address the uncertain future and promote more positive development that gives back more to the earth than it takes. This is important, because minimising impact is not enough – we are already overloaded, using up three planets worth of resources – we need to actively replenish planetary eco-systems while minimising the use of irreplaceable resources. Housing has a particular role to play here, being the largest sector of building both in terms of volume of construction and energy use in the UK.

The role of redundancy in design

There are many different definitions of the term resilience (Hassler and Kohler, 2014a). Designing buildings and communities to be more resilient is defined here as being able to ‘resist, absorb, accommodate to, and recover from unpredictable climate change effects in a timely and efficient manner, while preserving and restoring essential basic structures and functions’ (UNISDR, 2009). Resilient design in socio-ecological-systemic (SES) terms according to Biggs et al (2012) takes account of how human communities interact with their environment. Within SES, this paper aims to identify the redundancy (the ability to switch between numerous available choices beyond optimal design) of available means and methods in housing and home environments in order to prevent performance failure either in unexpected circumstances or in response to varying user needs, working with climate change. Redundancy relies on diversity of choices – the greater the number of different choices available the greater the potential redundancy. Redundancy analysis covers; technologies, fabric and systems interrelated with social aspects and the extra capacities of a housing community compared to an individual trying to keep control of internal environment.

Individual and collective learning to improve redundancy

Social learning according to Sørensen’s ([10] p.6) can be characterised as ‘...a combined act of discovery and analysis, of understanding and giving meaning, and of tinkering and the development of routines. In order to make an artefact work, it has to be placed, spatially, temporally, and conceptually. It has to be fitted into the existing, heterogeneous networks of machines, systems, routines, and culture.’ It is increasingly recognised, that the effectiveness of the collective learning that takes place in housing developments can play a major role in terms of housing performance, over and above individual social learning (Chattertton, 2013). The collective learning may happen within a whole range of learning
environments ranging from individual trial and error, peer to peer learning, group meetings, and collective learning using internet based tools. Having more than one way to learn how to tackle a problem increases social redundancy which is linked with the capacity to share resources and ideas and to learn collectively.

As Hassler and Kohler point out (2014): ‘Resilience depends upon sentience and capabilities that must be embodied within people (and not automated systems). The design of any system must provide clear feedback on its performance to allow for learning and adjustment’. Having multiple feedback loops linked to social learning also helps to increase social redundancy.

**Case Study – LILAC**

One case study is examined here in depth for its redundancy potential because of its particularly unusual socio-economic and ecological credentials which mark it out as an exemplar for others to follow (Flyvbjerg, 2006). The award-winning LILAC (Low Impact Living Affordable Community) urban co-housing development in Leeds, UK was completed in 2013. It consists of twenty dwellings as a mixture of terraced houses and three storey blocks of apartments. The building construction is carbon positive, consisting largely of Modcell timber frame panels infilled with straw insulation (Fig. 1) to form walls and a flat roof, together with a concrete floor.

![Fig. 1. Showing Modcell straw/timber frame system and Common House at centre of LILAC.](image)

Each apartment has a natural gas combi-boiler with a 24 hour manual heating programmer, and radiator heating system combined with a whole house mechanical ventilation heat recovery system. The houses have a hot water heating system consisting of unvented hot water storage tank heated either by solar thermal panels or the gas boiler or an electric immersion heater as a backup, all served by an electronic weekly programmer. In addition there are photovoltaic solar panels on the flat roofs (1.25kWp from five PV panels...
for each home) which provide each home with renewable energy. The homes were not built to meet the PassivHaus energy standard of 15 kWh/m²/pa or less for active space heating, being designed instead for the broader voluntary standard of UK Code for Sustainable Homes Level 4. This was nevertheless closer to PassivHaus in terms of external fabric insulation standards than the building regulation requirements in force at the time.

The residents came together as an intentional community committed to sharing resources in order to ‘tread on the ground lightly’ with commonly held values of environmental sustainability, self-reliance, grassroots, learning, equality, wellbeing, diversity and maintaining an ethical policy (Chatterton, 2015). The housing surrounds a shared ‘Common House’ that contains a communal kitchen, dining room, multipurpose room, laundry, office and toilet (Fig. 1). This is a vital social centre which, as we will see later on, is at the core of available environmental and social redundancy in this development.

Results and analysis

A 15 month POE study of LILAC, carried out from April 2013 – July 2014 utilised a number of investigative methods which were triangulated to provide a rich analysis of how all the homes were performing, how people were living in them, and how the community was functioning in relation to the housing development as a whole. Methods included semi-structured interviews and home tours with all households, home user guidance evaluation, a Building Use Studies questionnaire, construction audit, monitoring of temperature and humidity in all homes for a year, thermal imaging, analysis of the maintenance logging software, analysis of the governance system for the community, action-research interventions to analyse particular problems related to the ventilation systems, and a usability survey of all environmental control ‘touchpoints’ in the home which the user can interact with. For the purposes of this paper, results from all these investigations have been explored specifically to understand the redundancy factors in two key areas of redundancy: the environmental and the social.

Environmental redundancy

In terms of heating and hot water, LILAC relies on a traditional natural gas supply directly from the grid for individual boilers in each home. However, there is a high degree of environmental redundancy in relation to energy supply given the photovoltaic that can supplement a small amount of heating in emergency to the gas supply, as well as the thermal solar panels on the houses. There is also a back-up electric immersion heater which offers further diversity of supply. The Common House provides several additional environmental redundancies not normally available in housing developments, including an alternative supply of heating, via the woodstove, should all else fail. If there is a water failure
in any of the houses, the Common House also provides extra diversity and redundancy through its separate water system. The sharing of food in the communal kitchen and dining room in this building offers yet more additional environmental redundancy, giving people the choice of individual or collective cooking, which can be a lifeline if someone in the community is not feeling well.

Turning to the redundancy available in the ventilation systems, LILAC window and external door openings are roughly 50% of the overall glazed area, and can be opened wide (Fig.2). The provision of robust and diverse window openings for night purging ventilation is critical in relation to climate change predictions for warmer summers in the UK – arguable the high degree of redundancy that is required in window openings to cope with future conditions is present in LILAC. Shading provision is one of the most effective ways of mitigating overheating (Gupta and Gregg, 2013). There is no solar shading for the windows and external doors per se in, which would help to avoid overheating both now and in the future due to climate change, but LILAC does have some nominal shading offered by south facing balconies, which the community plan to increase with additional deciduous planting.

There is often a natural tendency to optimise the number of window openings in relation to mechanical ventilation systems to achieve cost savings in affordable housing, with no allowance for redundancy and over-ventilation options to deal more resiliently with future unpredictable climate changes. A recent MVHR study (NHBC 2013) revealed that occupants were suffering from overheating in the summer of 2011 in the UK due to only being able to open a patio door and no windows in the lounge at night. Fortunately in the case of LILAC there are ample window opening options in each room, including the bathroom, which is increasingly uncommon, and these were not compromised by the fitting of the MVHR system. One household stated that they had the ‘MVHR often off at night because of the noise. We often open windows and have MVHR off to save energy.’ This is a classic illustration of redundancy at work, where the secondary ventilation system (windows) is used in tandem with the primary one (MVHR) to save energy and promote comfort. It is particularly important to have the extra redundancy of ventilation systems in the bathroom, because failure of one system here could be catastrophic for the straw construction due to excessive moisture presence.
In LILAC, the optional utilization of internal space (e.g. moving to a warmer/cooler room within the home, according to orientation and time of day), using mechanical aids (e.g. ceiling fans) or operating the building fabric itself (e.g. opening and closing windows, doors, adjusting plant shading, adding white solar reflectance to the roofs etc) and outdoor living spaces will become increasingly important in making homes more resilient. Furthermore, the central pond/balcony feature (Fig.2) provides an external communal ‘coolth’ place for people to retreat to in the summer if their homes or Common House become too hot.

Social redundancy

LILAC constitutes a very well integrated community with a high level of communication skills. Out of 20 BUS questionnaires returned (100% return rate) 17 mention highly positive experiences of leisure, contact or support that the community offers. All members have access to the community notice board as well as internal mail, twitter and an on-line forum. The main means of information dissemination on home use to all members is via email. Many different forms of learning take place – individual learning through conversations on doorsteps, at the communal laundry, in the allotments or at the Common House post room area, and collective learning through group meetings, shared dinners, twitter and email exchanges. This shows a high degree of social redundancy in the housing development given the variety of means of communication and learning that are available.

Seyfang et al [22] have identified a number of different methods used by community groups to improve their understanding of energy use. They note the quality of the group concerned as decisive in terms of its success in achieving its aims, followed by the skills available within the group. LILAC has a highly varied demographic and skill set among its members. This includes a number of occupants who have become technically proficient and
this provides greater social redundancy rather than the whole group typically relying on one ‘maintenance contact’ as is the case with many normal housing developments. A dedicated ‘maintenance task team’ manages incident reports for all the households organizing necessary repairs with the help of bespoke software accessible to all members. The system effectively takes care of all trouble shooting needs.

At the same time, it is clear from LILAC’s task team structure that understanding home energy use is only one of a number of key concerns related to low impact living and is not a top priority. With limited time, members have to balance their collective desire to understand the various aspects involved in developing low impact living with their need to communicate to others outside of LILAC and their need to try and understand how their own homes perform. As a result little time is left for forward planning by reflecting on current home use patterns and possibilities to facilitate further improvements. Lack of time can be the chief limitation on built in redundancy working effectively.

Conclusion

The overall aim of this paper was to identify the redundancy potentially available in housing developments. Results in this case study indicate the variety and benefits of extra redundancy in housing design and community development to accommodate varied user preferences, increase occupant learning leading to energy savings, and cope with unexpected failures. It is vital that all homes and developments are future-proofed with the degree of environmental redundancy shown in the case study presented, and designed in a way to allow these features to be added or activated, given that resilience contains both a preventative and a recovery aspect. Clearly there are potentially extra time and financial costs involved in delivering the high degree of environmental and social redundancy that exists in case study housing development. However, LILAC has been able to accommodate these extra costs through a small reduction of space standards in the homes and the use of a relatively low cost construction system, in order to be able to afford the additional Common House and other extensive external environmental features (Chatterton, 2015). A better understanding of the cost v. benefit of the time or monetary contribution required to implement social or technical redundancy is needed, however, in order be able to justify these measures on a wider scale. These costs should be evaluated in context of wider energy and health savings made through the greater resilience achieved.

Thinking this way will require a new approach to designing housing developments for future which have suitable resilience. Within the UK architectural education system, there is no requirement for students to have knowledge of how to design for climate change as part of the RIBA Criteria, merely ‘Adequate knowledge of physical problems and technologies
and the function of buildings so as to provide them with internal conditions of comfort and protection against the climate’ (authors italics). A first step will be to introduce the notion of resilient redundancy into the design curriculum and training for the design team.

Acknowledgements
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References


Climate Resilience in New-Build Social Housing: Challenges, opportunities and unintended consequences

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ABSTRACT New low-carbon houses in the UK are designed to reduce heat loss through improved air-tightness and increased insulation, potentially raising the risk of summertime overheating now and in the future. This paper uses a socio-technical building performance evaluation approach to empirically examine the extent of climate resilience, specifically against overheating, of six case study dwellings across three low carbon social housing developments in Southeast England. Using a combination of physical monitoring of environmental conditions, window opening/closing, and commissioning review of ventilation and heating systems, actual data is gathered on the way people operate their homes to reveal any unintended consequences that can accentuate overheating risk and discomfort. The findings indicate that indoor environmental conditions are determined by a complex relationship between the performances of building fabric, systems as well as interaction of occupants with them, which is determined by their understanding and comfort expectations. High summertime indoor temperatures are linked to window opening patterns and heating system faults. If climate resilience is not considered at the design stage of low energy housing, the overheating risk will increase, thereby further widening the performance gap.

KEYWORDS: Resilience; Overheating; Low carbon housing; Social Housing.

Introduction: challenges

The Intergovernmental Panel on Climate Change’s fifth assessment report (IPCC, 2014) projects a future with increased heatwaves and more frequent hot temperature extremes over most land areas among other hazards. Also recent research has shown that heat-related hazards are projected to impact the UK resulting in overheating in the domestic sector (Gupta and Gregg, 2013; Mavrogianni, et al., 2012; Porritt, et al., 2012; Gupta, Gregg and Williams, 2015). As the vast majority of dwellings in the UK are free-running in summer, the changing climate is projected to render natural ventilation insufficient for thermal comfort (Lomas and Ji, 2009; Tillson et al., 2013). Other studies have indicated that indoor overheating may be an issue in newly-built homes that are constructed to high energy efficiency standards not only during summer but also during winter (NHBC, 2012). To
highlight the urgency of the matter, post-occupancy evaluation research has shown that risk of overheating is already experienced in some older existing dwellings in the UK (Lomas and Kane, 2013; Gupta and Gregg, 2013), in post-1990 houses and purpose built flats (Beizae, Lomas and Firth, 2013) and in prototype houses built to zero carbon standards (Dengel and Swainson, 2012). For the reasons above advancements in high sustainability standards (to reduce CO₂ emissions driving climate change) applied to either new or existing buildings will need to be resilient to oncoming climate change.

The social housing sector in the UK has been expected to lead the way in implementing the Code for Sustainable Housing (CSH) (McManus, Gaterell and Coates, 2010) which was put in place to lead the UK new-build domestic sector to meet carbon reduction goals (Zero Carbon Hub, 2015). These new and retrofitted low-carbon houses in the UK, designed to reduce heat loss through improved air-tightness and increased insulation, with greater reliance on mechanical ventilation, and often designed with no shading, have the potential to overheat throughout the year (Dengel and Swainson, 2012; Gupta, Gregg and Williams, 2015). Heat vulnerability is assessed according to the sensitivity, exposure and inability of individuals to adapt or access treatment; determinant factors are age, health and social isolation (physical and psychological determinants) (Kovats and Hajat, 2008). Social housing residents in particular may face challenges as they can lack the awareness and/or financial ability to adapt to a changing climate (Mavrogianni et al., 2015). Those particularly of the age which were found to be most vulnerable in heatwaves, can be at greater risk when unable to adapt whether through financial, environmental, social, or psychological limitations (Peacock, Jenkins and Kane, 2010). Given this context, there is a pressing need to evaluate the summertime thermal performance of new low-carbon social housing due to their potential overheating risk and high concentration of vulnerable individuals (Mavrogianni et al., 2015). At the same time little is known about the behaviour of people in their homes, and the overall comfort conditions in these houses in relation to the performance of systems such as the Mechanical Ventilation with Heat Recovery (MVHR). Building performance evaluation (BPE) research can be an effective method for assessing the technical and social risks, and solutions. This is a necessary step towards development of climate-resilient and sustainable social housing.

Assessing climate resilience using Building Performance Evaluation (BPE) methodology

The present study examines how BPE can be used to assess overheating risk and climate resilience in new-build low energy social housing dwellings. The BPE studies were funded by the UK Government’s Technology Strategy Board (now Innovate UK). Using a combination of physical monitoring of environmental conditions (indoor/outdoor temperature,
relative humidity and CO₂ levels at five minute intervals), window opening-closing, and commissioning review of ventilation and heating systems, actual data is gathered on the way people operate their homes during the summer to reveal any unintended consequences that can accentuate overheating risk. Summertime thermal performances of the dwellings are assessed to show the current level of overheating risk using static and dynamic overheating metrics. The extent of occupant heat vulnerability is examined through usability surveys of controls, questionnaire surveys and semi-structured interviews of occupants which also help to understand occupant sensitivity, exposure and ability to adapt.

To quantify overheating risk, CIBSE Guide A (2006) provides static benchmark summer peak temperatures (26°C and 28°C, bedroom and living room respectively) and overheating criteria (temperature is not to exceed benchmark summer peak in respective space for over 1% of annual occupied hours). Though these recommendations are sound, the assumption that there is a single indoor temperature limit irrespective of outdoor conditions has been challenged (Nicol et al., 2009). Alternatively, CIBSE TM52 (2013) which is based on EN15251 presents a dynamic metric that takes into account outdoor conditions and adaptive response. For the purpose of this study Criterion I was applied, estimating the frequency of overheating occurrences in the monitored dwellings, according to which the differences between the internal operative temperature and Tmax should not be greater than or equal to 1°C for more than 3% of occupied hours from May to September.

**Empirical assessment of climate resilience and overheating risk**

The six case study dwellings are part of three exemplar social housing developments. The case studies (two per development) were selected to represent a variety of built forms and construction systems with similar occupancy profiles; all case study dwellings are occupied by families with young children. Table 1 presents the background characteristics of the case studies and Table 2 presents an overview of their design specifications and construction details.

<table>
<thead>
<tr>
<th>Table 1. Case Studies Information.</th>
<th>Development A</th>
<th>Development B</th>
<th>Development C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case study</strong></td>
<td>Case A1</td>
<td>Case A2</td>
<td>Case B1</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>94 m²</td>
<td>94 m²</td>
<td>88 m²</td>
</tr>
<tr>
<td><strong>Orientation</strong></td>
<td>South North</td>
<td>South North</td>
<td>East-West</td>
</tr>
<tr>
<td><strong>Typology</strong></td>
<td>2 bed, mid-terrace</td>
<td>2 bed, mid-terrace</td>
<td>3 bed, end-terrace</td>
</tr>
<tr>
<td><strong>Occupancy</strong></td>
<td>24h</td>
<td>24h</td>
<td>15:00-8:00</td>
</tr>
<tr>
<td><strong>Occupants</strong></td>
<td>2 adults, 2 children</td>
<td>2 adults, 2 children</td>
<td>2 adults, 2 children</td>
</tr>
</tbody>
</table>
Assessment of design intent for resilience to overheating

Resilience in buildings is defined as the ability to ‘resist, absorb, accommodate to and recover from unpredictable climate change effects in a timely and efficient manner, while preserving and restoring essential basic structures and functions’ (UNISDR, 2009). Of greatest concern is that none of the case studies have external solar shading for windows, which can be one of the most effective ways to mitigate overheating (Porritt et al., 2012; Gupta and Gregg, 2013). All case study houses have MVHR systems, although windows can be opened to a sufficient degree. Apart from high insulation, the dwellings are also characterised by low thermal mass (gypsum board walls and carpeted floors) that can potentially increase the overheating risk. The evaluation of fabric performance through U-value tests and thermographic surveys revealed that insulation levels were found to be good with no major thermal anomalies. However air-permeability tests revealed a noteworthy gap between designed and actual air-tightness in all cases (as shown in Table 2). All houses failed to comply with the UK Building Regulation Best practice air permeability rate (5m³/m².h) and Case A2 did not even meet the UK Building Regulation requirement (10m³/m².h).

Overheating risk assessment

The temperature distribution in living rooms and bedrooms is shown in Table 3. Following CIBSE Guide A (2006) static overheating criteria, the majority of the living rooms (four out of six) demonstrated overheating during the non-heating season with temperature remaining above 28°C for more than 1% of occupied hours. Bedrooms temperatures indicate potential to overheat in all houses. However, it should be noted that in Cases B2 and C2 the heating was on during the summer months (June-August) as a result of heating system failures leading to unusually high temperatures inside the houses. Using the (dynamic) adaptive thermal comfort metric (CIBSE, 2013), the percentage of overheating and hours of

Table 2. Design specifications and construction details of case study developments.

<table>
<thead>
<tr>
<th>Development A</th>
<th>Development B</th>
<th>Development C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target design rating</td>
<td>CSH Level 5</td>
<td>CSH Level 4</td>
</tr>
<tr>
<td>Construction type</td>
<td>Timber frame with cast hempcrete</td>
<td>Steel frame with pre-insulated panels</td>
</tr>
<tr>
<td>Main construction elements</td>
<td>Walls: Hempcrete, U-value: 0.18</td>
<td>Walls: Pre-insulated panels, U-value: 0.15</td>
</tr>
<tr>
<td></td>
<td>Windows: double glazing, U-value 1.4</td>
<td>Windows: triple glazing, U-value ≤1.2</td>
</tr>
<tr>
<td>Space heating and hot water system</td>
<td>EAHP, underfloor heating and solar collectors</td>
<td>ASHP, underfloor heating, immersion heater back up</td>
</tr>
<tr>
<td>Target air tightness</td>
<td>2 m³/h/m² @50Pa</td>
<td>3 m³/h/m² @50Pa</td>
</tr>
<tr>
<td>Actual air tightness (m³/h/m² @50Pa)</td>
<td>5.36</td>
<td>5.54</td>
</tr>
<tr>
<td>Ventilation strategy</td>
<td>MVHR through EAHP</td>
<td>MVHR</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>4kWpk Photovoltaics</td>
<td>1.5kWpk Photovoltaics</td>
</tr>
</tbody>
</table>
temperature exceedance of the upper limit in living rooms and bedrooms across the six case studies were estimated. The percentage of occupied hours when internal temperatures exceed the upper comfort limit by 1K is shown in Table 3. According to this metric the spaces do not overheat, with the exception of Case B2 bedroom where the heating was on during summer. With this approach the risk of overheating appears to be significantly lower than when using the static metric.

Table 3. Percentage of time that temperature exceeds the static and dynamic comfort limits during occupancy hours in living rooms and bedrooms (May – September). Note: overheating is indicated by bold number in darker field.

<table>
<thead>
<tr>
<th>Case study house</th>
<th>Living room occupied hours</th>
<th>Bedroom occupied hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Static (% hours &gt;28°C)</td>
<td>Dynamic (% hours +1K above limit)</td>
</tr>
<tr>
<td></td>
<td>Dynamic (% hours &gt;28°C)</td>
<td>Static (% hours +1K above limit)</td>
</tr>
<tr>
<td>A1</td>
<td>0.7</td>
<td>0</td>
</tr>
<tr>
<td>A2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>B1</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>B2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>C1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>C2</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Complaints of high summer temperatures in Developments A and B indicate that the houses are not very adaptable to warm weather conditions. This is related to the lack of shading devices, lack of cross ventilation and/or low thermal mass of the houses. In Development C summer temperatures are perceived as comfortable from the majority of the occupants despite the fact that the two case studies from Development C presented high indoor temperatures, as shown in Table 3. These findings indicate that the perception of comfort varies greatly between different occupants.

Window opening behaviour

Occupant behaviour is considered to have a significant impact on overheating (Mavrogianni et al., 2014; Porritt et al., 2012). The open-close state of windows in living rooms and bedrooms were monitored alongside environmental conditions. The hourly percentage of window opening for the summer season is plotted against hourly average internal temperatures in Figure 1. Between May to September, occupants in all houses opened their windows for long periods of time in order to purge excess internal gains. In all houses, bedroom windows were left open throughout the day whereas the opening of living room windows tend to follow occupancy patterns possibly due to security reasons as the living rooms of all case study houses are on the ground floor. As a result of this pattern, bedroom temperatures were 1-2°C lower than living room temperatures indicating the positive effect of window opening.
A comparison between Cases A1 and A2 has shown that the occurrence of high temperatures in the living room during summer is lower in Case A1 than Case A2 even though the houses have similar occupancy and Case A1 is far more air-tight. This however is more related to the fact that occupants in Case A1 tend to open their windows more during summer than occupants in Case A2 (Figure 1). These results indicate that summer performance is highly linked to occupant activities such as window opening and the mitigation of internal heat gains and that window opening behaviour is more related to occupants’ habits and personal preferences than fabric characteristics.

Unintended consequences: influence of occupant control and understanding of systems

Resilience of a building should also take into consideration the quality of interaction a building offers its users, their understanding of what is offered and expected of them, and their ability to turn the understanding into action and change (Stevenson and Baborkská-Narozyň, 2014). With this consideration, the design, installation and commissioning of heating and ventilation systems were examined along with the performance and usability of their control interfaces to ensure the services are capable of creating the required environmental conditions. Table 4 summarises the common issues across the three developments.

Table 4. Common issues highlighted by review of systems and controls.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Development A</th>
<th>Development B</th>
<th>Development C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVHR imbalance between supply and extract air flow</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MVHR unit located in loft inaccessible</td>
<td></td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MVHR terminals not locked in fixed positions</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MVHR terminals closed by occupants</td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Several MVHR system breakdowns</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>No indication of MVHR system response or failure</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Poorly commissioned heating controls</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>
Ventilation and controls

In all six case study houses, the MVHR systems proved to be problematic: improper commissioning and system imbalance (all cases), breakdowns (Cases B1, B2), noise (Case C1) and cold draughts (Case B1). The MVHR supply and extract terminals in all cases were not locked in fixed positions, allowing the occupants to adjust them at will, resulting in insufficient fresh air supply, adding further to system imbalance and affecting indoor air quality. Provision of usable and accessible controls for the MVHR system was also an issue in all cases. The location of the MVHR units in lofts (Cases B1, B2, C1, C2) made the units’ presence unknown and inaccessible to occupants, seriously compromising maintenance and resulting disuse. As a result of this, the MVHR system in Case B2 had broken down without the occupants realising it. Furthermore, the position of the supply outlets of the MVHR system directly above the beds in Case B1 bedrooms caused great discomfort (due to cold draughts arising from system imbalance) to the occupants who decided to manually shut the supply terminals. Similarly, occupants in Cases C1 and C2 had completely shut the supply terminals thus seriously undermining the performance of the system.

Heating system and controls

The connection of heating controls with room thermostats was found to be problematic in most houses. In Development A, a commissioning check before the move-in revealed that zone thermostats were not properly wired to the master thermostat. In Development B, some of the over-designed wireless room thermostats (one per room) had not been properly connected to the heating systems resulting in the heating being constantly on, even during summer, which led to overheating and energy wastage. The commissioning problem was discovered during the study several months after the move-in following occupant complaints of inability to control heating and of rooms being too hot. Occupants in Case B1 had turned off the heating system completely in order to save energy, whereas occupants in Case B2 were unaware of the problem, resulting in high temperatures recorded in the Case B2 bedroom and living room during summer. Similarly, in Case C2, the heating system malfunctioned during summer leaving the heating constantly on during July and August. Occupants did not consider switching off the radiator valves but instead kept all the windows open throughout the day in order to purge the excess heat. Despite their efforts, very high temperatures were recorded in the house during the summer months. The issues observed in Cases B2 and C2 would have been addressed much faster if the occupants had good understanding of the systems and their operation and maintenance needs.
Occupant understanding

The study revealed that occupants in all houses either failed to fully understand and retain the purpose and operation of the heating and mechanical ventilation systems, or forgot the information that was provided to them initially. Lack of understanding is related to the quality of handover and user guidance offered to the occupants. A review of the handover provided across all three developments revealed that a more phased approach is needed as occupants struggle to retain information provided to them. User Guides also evaluated were in all cases found to be very lengthy and confusing as they included very detailed system information instead of simple guidance on the daily and seasonal operation of systems.

Conclusions

The findings indicate that indoor environmental conditions are determined by a complex relationship between the performance of building fabric, services and systems as well as interaction of occupants with them, which is in turn influenced by occupant understanding and comfort expectations. BPE offers an empirically-based socio-technical approach for assessing resilience which can help to identify unintended consequences related to system malfunctioning or occupant behaviour. The analysis of the monitoring data suggests that the case study houses already experience temperatures above the recommended CIBSE thresholds during the warmest days of summer. However, estimates of the magnitude of current overheating risk largely depend on the criterion used. Although houses are not yet overheated according to dynamic assessment, they are exposed to high temperatures which for a vulnerable population should be closely monitored. Analysis of monitoring data also showed that window opening acted as the principal mitigating measure against overheating in the homes. This however may be insufficient when the external ambient temperature goes above what is comfortable. In addition, this is not always the best solution where safety, noise and pollution limit window use. These issues need to be carefully considered during the design stage, in order for buildings to be more adaptable and resilient to future climate.

The BPE study also revealed that poor commissioning of heating and ventilation leads to system inefficiencies that also affect indoor environmental conditions. This is why seasonal commissioning along with training (and re-training) of residents needs to be undertaken for all new low energy houses as a matter of course. Controls need to be designed and installed in a more intuitive and user-friendly way that encourages occupants to interact with their environment in an adaptive and positive manner. Poor control and understanding of services and systems challenges the occupant's ability to adapt to change compromising the resilience of buildings. Occupants need to be trained through graduated and extended handover procedures that involve hands-on demonstration, supplemented by home user
guides offering clear visual guidance on the daily and seasonal operation of systems and controls.

Given that overheating is already being experienced in new-build (and existing) dwellings throughout the UK, and is projected to increase in future, it needs to be tackled through resilient design, effective handover and improved occupant understanding of services and systems. Otherwise energy-intensive air-conditioning could be retrofitted in overheated homes challenging national carbon targets and further widening the performance gap. It is therefore vital that future Building Regulations address both carbon reduction and climate resilience for new-build and existing buildings.
References


Session 14

Resilience, Vulnerability and Climate Change
ABSTRACT The urgency of climate change, and the collective responsibility it entails, requires a greater understanding of cultural approaches to environmental change and its interaction with diverse social contexts. This requires an extension of our understanding of climate change from the scientific to the socio-cultural realm. Cultural understanding implies investigation that extends to the human scale, revealing challenges that are often overlooked at a national or intergovernmental level.

This paper will compare how climate change is approached as a design input in different cultural contexts, detailing work undertaken by design-research studios in the Universities of Sheffield and Cape Town to address local responses to climate change as part of the Worldwide Universities Network ‘Transcultural Understanding of Designing with Climate Change’ project.

The Sheffield studio’s work is focused on adaptation through design, informed by the modelling of future climate scenarios. This represents a cultural context where there is popular political will to devote time and resources to mitigating climate change, and various codes set out minimum standards for response. The Cape Town studio is focused on a context of rapid urbanisation, skills shortages, and a low tax base, where the state is unable to provide basic services such as electricity and water to many citizens. A lack of reliable data about energy consumption means that environmental decision-making is intuitive; while the peculiarities of the unequally developed economic and political context requires a more nuanced approach to engagement with communities.

KEYWORDS: Climate change; adaptation; cultural context; design research; resilience.

Introduction

Temperatures in Cape Town reached 42°C in March 2015 – the highest since records began. Wildfires ignited in Cape Town National Park burned through 15,000 acres of land. The summer fires are part of the natural process of the regeneration cycle of the native fynbos which covers the Cape peninsula – this fire was the worst seen in decades, but the City Fire Service and local volunteers limited the damage to only 13 properties. At one stage, with flames licking the edge of the farm, the historical collection of furniture at the oldest wine estate in South Africa, Groot Constantia, was removed for safe-keeping.

This is the latest and perhaps the most acute example of a changing climate and the still heavily tourist and agriculture-reliant economy of the Western Cape coming into conflict...
there are other longer-term examples of systematic conflict. Wine cellars need to be maintained at a long-term average temperature of 13°C. Gradual seasonal changes in temperature are acceptable, but rapid diurnal fluctuations damage wine irrevocably. Daily mean temperatures fluctuate between 11.9°C in July and 20.4°C in January and February, with average highs of 26.5°C.

**Load Shedding**

It is not only the seasonal fires that threaten wine production. Rolling blackouts, euphemistically referred to as ‘load shedding’, are increasing in frequency, interrupting the flow of mechanically chilled air that is essential to the maturing process. In the 1990s the South African Government prohibited the state electricity provider Eskom from investing in new power infrastructure in an effort to deregulate the industry; however no private investors came forward to build new power plants. Rolling blackouts were introduced in 2007 as demand outstripped supply for the first time. In 2008, multiple trips across the power network forced production to cease in major gold and platinum mines across the country (McGreal 2008). Despite construction of new power stations, the re-commissioning of mothballed coal power plants, and the introduction of diesel-powered generation at peak times, power cuts have persisted. In November 2014, Eksom could only provide 24GW of electricity, 4GW short of demand and a full 22GW short of a stated operational capacity of 46GW (England 2014). This shortfall was blamed on shortages of diesel, water reserves in hydroelectric facilities, and unplanned maintenance. Depending on the severity of the rolling blackouts, the economic cost in terms of lost productivity is estimated at R20-80 billion (£1.1 to £4.5 billion) per month (Lipton 2015).

Typically power outages hit in the late afternoons at the hottest times of the year, and it is in the major centres of employment that the economic cost is really telling. There is an urgent need to rethink the electricity dependent model of office provision for the financial service industry in the centre of cities like Cape Town and Johannesburg.

**Energy Regulations and Buildings**

In 2012 the SANS 10400–XA ‘Energy Usage in Buildings’ Regulations were added to the National Building Regulations. The standards set out minimum targets for energy consumption at the design stage, as well as detailed requirements regarding orientation, daylighting and insulation. These rules can be circumvented by the employment of a ‘competent person’ who can demonstrate that a notional building can achieve energy savings equal or better to those that would be achieved by following the standard to the letter (Mnguni & Tucker 2012). A further section of the standard requires that a maximum of
50% of the annual domestic hot water requirement of a building can be met by electricity. The regulations affect all new buildings, but only extensions to existing buildings (Sustainability Institute 2012).

The Portside building in Cape Town (Fig. 1) typifies the recent approach to the developer led design of spec office space in Cape Town. Built for Old Mutual and FirstRand Bank at a cost of R1.6 billion, the tower was designed to project an image appropriate for international global investment in South Africa through the provision of 52,000 square metres of Grade A office space. The energy strategy for this type of building, fully air conditioned with more or less efficient measures such as heat recovery systems or intelligent building management, relies on plentiful and reliable supplies of electricity, particularly in the hottest months of the year when infrastructure is at its most fragile.

Fig. 1. The Portside building, Cape Town.

The building was the first substantial new build office constructed in Cape Town for fifteen years, and was awarded five stars from Green Star SA Office Design. This rating system is based on the Green Building Council of Australia’s rating system, adapted to a South African context. Similar to BREEAM and LEED, accreditation is based on a weighted holistic assessment including criteria such as building management, indoor environmental quality, transport, water use, materials, land use and ecology, as well as energy consumption and carbon emissions (Green Building Council of South Africa 2013). However, the all-glass construction of the building, with deep floor plans requiring high levels of servicing, is an indication that understanding of the reality of the performance gap has not yet filtered down to architectural practice in South Africa, and it is highly unlikely that this building will perform as well as may be assumed from the plaudits it has received.
While the construction of new buildings such as will have a big impact, more often than not it is concrete framed buildings from the 1960s, 70s and 80s that are refurbished and expanded to supply demand for office space in the city. The most intensive part of this process in terms of energy consumption is the replacement of the skin with new glass and panel based façade systems with ‘improved’ thermal performance. In reality this means higher standards of insulation and increased airtightness, both of which can contribute to greater demand on air conditioning systems in summer.

As post-occupancy data for energy consumption in South Africa is not routinely collected or published, research into energy performance is highly speculative. However the energy consumption of the South African building stock is increasing rapidly, currently accounting for 31% of electricity consumption and 28% of carbon emissions in the country, with emissions from commercial buildings projected to rise from around 30MT of CO2 per annum to over 70MT in 2050, or over 50MT assuming ambitious efficiency savings (Milford & UNEP Sustainable Buildings and Climate Initiative 2009).

**University of Cape Town**

Energy consumption is therefore an issue which students are encouraged to address at the School of Architecture at the University of Cape Town. The school takes a cohort of around 100 students at undergraduate level and 60 at Masters level each year. Masters students develop ‘thesis projects’ that are similar in resolution to what would be expected of Part 2 students in the UK. The school lacks the more advanced technological resources that are available in Sheffield (e.g. environmental modelling software), but the studio based teaching approach is similar. Students discuss their projects in a group setting with their tutors, contributing to the review of their peers.

Sophie Zimmermann’s project to refurbish Christiaan Barnard Memorial Hospital is an example of an intuitive design response to the need to reduce electricity consumption in the city (Fig. 2). It takes inspiration from a generation of thermally massive concrete buildings constructed in the 1960’s and 70s, an architectural response that may be more resilient to warmer temperatures and unreliable power generation in years ahead. If internal temperatures can be maintained at close to comfort levels for prolonged periods without space heating or cooling systems, limited power resources or backup systems can be focused on supplying essential I.T. and other systems needed to maintain operations (essential in a hospital but also desirable in other sectors to reduce economic disruption).

This kind of student-led research into pressing environmental issues is necessarily reactionary – there is a lack of reliable data about energy consumption of buildings in use and projections of future energy supplies and climate are hampered by big uncertainties. Students' work is a reaction to problems as they arise, in contrast to Sheffield where a
wealth of information means that students can speculatively address potential problems and propose solutions that are implementable before lasting damage is sustained.

The University of Sheffield
In some cases students at Sheffield are actively engaged in the gathering of data that can better inform how we think about designing buildings that can be used more efficiently in future. Hannah Towler’s third year dissertation project asks whether improved awareness of energy consumption on the part of building occupants can encourage them to load match energy demand to production. The case study, LILAC, is a 21 unit community housing development in Leeds with a sizable photovoltaic installation, but the research also explores the constraints imposed by occupancy patterns, peak loads, and public misconceptions about energy use on a much wider, national, scale (Fig. 3).
Fifth year Alex Johnstone’s research explores the environmental performance of the Alfred Denny building at the University of Sheffield, constructed in the 1960s. The thesis investigates the embodied carbon content of the existing superstructure of the building, representative of similar concrete frame buildings from the period, and explores potential refurbishment options (including operational energy consumption and carbon emissions) (Fig. 4). The performance gap between predicted and actual operational energy consumption has received much attention in the UK recently as post-occupancy evaluation of newly completed buildings reveal that there is little correlation between predicted and actual energy use (Steadman & Hong 2013).²

Alex’s research concludes that the structure can be re-used in an energy efficient manner, a conclusion with serious implications for the demolition of similar buildings across the UK, where it has been demonstrated that new buildings often consume up to five times as much energy as they are designed to (de Wilde 2014).

Fig. 4. Alex Johnstone’s analysis of the structure of the Alfred Denny building.

The Importance of Social Context

The direct way in which Cape Town students are encouraged to address the architectural consequences of environmental change builds upon a reputation of addressing seemingly insurmountable social problems e.g. income disparity broadly divided along racial lines.

Projects often tackle complex sites in the Cape Flats, dealing with informal settlements, transport interchanges and other places of economic exchange, as well as service provision for the urban poor. There is no room for overly idealistic thinking. Many years of experience has led to a critical pedagogical approach to engagement with disenfranchised communities,
where the emphasis is on ensuring that unrealised projects do not cause further disengagement with planning professionals and local government, but instead that future architects and planning professionals are equipped with as complete a knowledge as possible of the challenges that these communities face, so that students are better prepared to practice with confidence in their future professional careers.

Louwrens Botha’s thesis project examines the motorway buffer zones between Cape Town and Somerset West – devised in the apartheid era as social dividers – and the potential regenerative inhabitation of the spaces around them, in order to knit the urban fabric and society back together (Fig. 5). The provocation is that while a resilient design philosophy may imply thinking about structures that can survive intergenerational change, some spatial structures are so rooted in the conditions of the past that they may need to be actively destroyed before regeneration can happen.

Fig. 5. Lourens Botha’s re-imagining of motorway infrastructure.

Conclusion

The latest available data suggests that electricity use within cities in South Africa accounts for 44% of total consumption across the country (2007), an increase from 41% in 2004 (Sustainable Energy Africa 2012). According to (Kennedy et al. 2009), Cape Town as an urban area was responsible for emissions in 2006 totalling 27 million tCO2e, compared with 47 million tCO2e in London. South Africa is still in a process of urbanisation, and due to its dependence on electricity predominantly generated by coal, it is the twelfth largest emitter of greenhouse gases in the world. In this context, deepening understanding of the root causes of poor energy performance in buildings is vital.

At the same time, it is important that architects of the future learn to proactively engage with the social consequences of climate change in different contexts. Planning human settlement requires a great deal of expertise and knowledge. Without the application of
engineering, cost controls, knowledge of material and environmental science and architectural construction, design ‘by’ the community can, despite the best intentions, turn into an arbitrary exercise in satiating short term desires, rather than development that can be resilient and long-lasting.

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Notes

1 According to the 2014 statistics, the wine industry now employs directly or indirectly some 300,000 people in the Western Cape, contributing R36.1 billion (£2 billion) to the GDP of the region (the contribution of the industry to GDP has increased by 10% per annum for over a decade) (Wines of South Africa 2014).

2 Note: There are related reasons for this: prediction models systematically underestimate energy consumption of buildings in use (often they are based on models required for compliance that do not measure total energy consumption); and energy consumption can vary widely between physically similar buildings (partly because there is little understanding or modelling of behavioural impacts on energy use).
Learning from New Orleans: The construction of resilient strategies for urban ecosystems

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**ABSTRACT** There is no other modern day example of recovery equivalent to the task at hand than New Orleans and the Gulf Coast. The magnitude and quantity of recent storms in conjunction with rapid land loss along the coast have demanded development proposals that simultaneously address needs and opportunities for social, ecological and economic innovation. Many objectives are at stake such as community vitality, infrastructural integrity, flood control, sustainable coastal ecosystems, and commercial and recreational activities. It is evident from past mistakes that the future viability of coastal communities is contingent on an adaptive urban realm. Success lies in the ability to provide reconfigured infrastructural systems and habitable urban landscapes that embrace processes taking on an agency of resilience and connectivity. Design at every scale has to take into consideration an unpredictable and fluid context. Policy and governance have to adapt in equal measure to environmental, economic and social needs of a community. And the community has to genuinely participate in this process.

This paper aims at evaluating the many lessons learned in the storm’s aftermath and reflects upon the needs identified by stakeholders through prototypically connecting local opportunities with larger regional urban systems in order to identify a set of responses unique to the vulnerability of coastal communities. Underpinned by a deeper understanding of ecological, communal and other regional networks to which such communities are irrevocably linked, the discussion emphasizes the interdependent nature of complex, coupled human-natural systems and the challenge ahead for designers as they envision futures in these changing socio-demographic, economic and environmental conditions. Architectural responses at varying scales designed in conjunction with multiple stakeholders increase the likelihood of successful implementation and facilitate the development of policies and funding mechanisms that build resiliency. The projects featured investigate the contextual relationship to community, water and infrastructure, connecting community-based and non-profit organizations, private-public investment, government agencies, and academia to reduce vulnerability through knowledge sharing, community-driven idea development and policy advocacy.

**KEYWORDS:** Vulnerability; interdependence; remediation; social ecosystems; resilient context; agents.
Introduction

The world is transforming at rapid pace, with disastrous events accumulating in increasing increments. Within this projection existing social, political, economical and cultural inequalities and instabilities such as the reduction of coastal wetlands and dire economic and demographic scenarios can greatly enhance the potential for natural and other disasters and at the same time have the potential to remedy post-disaster conditions through local risk-prevention strategies at a variety of scales. (Tierney, 2014) Social resilience is often defined as ‘capacity to reorganize resources and action to respond to actual danger, after it occurs’ (Wildavsky, 1988) or as the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change (Adger, 2000). Against public perception this paper aims to demonstrate how disaster can be identified as a positive catalyst for recovery, using the principles of adaptation and re-grounding based on pre-existing cultural and social codes.

Strong social connections provide the elasticity for communities not only to survive, but to ultimately thrive and regain their vitality after a disturbance. The structural integrity of a network of people is more difficult to destroy than that of a physical construct: it is elastic, intangible and unbreakable. Resiliency exists in connections between people and place. These connections can be built through a variety of systems and across a range of scales, both physical and temporal. Strategies can be large or small, perpetual or temporary, spontaneous or intentional. By setting a framework for people to meet, share, and connect, the invisible and intangible threads of a community grow in volume and strength, creating an elastic, resilient whole. The concept of shared space, the inherent attachment to place and culture that ultimately allows for the allocation of common resources and knowledge between individuals and across communities demonstrates the strength in collective identity to ensure resiliency. In this context Obrist et al. (2010) define social resilience “as the capacity of actors to access capitals in order to – not only cope with and adjust to adverse conditions (that is, reactive capacity) – but also search for and create options (that is, proactive capacity) and thus develop increased competence (that is, positive outcomes) in dealing with a threat”.

Learning from New Orleans: Context, Sociality, Agents

For the purpose of the paper three categories - context, social ecosystem and agents are identified as main ordering principles for establishing post-disaster resilience through shared space in urban environments. Context generally references the immediate or extended area of impact as a multi-dimensional platform for ground-up re-organization, emphasizing the strength of local networks as a means to connect to a larger realm. Social ecosystem identifies a set of beneficiaries related to private and public sectors that are
directly affected by decisions made at the local and governmental level while agents defines the very executors of the transformation strategies and the spontaneous, sometimes fragmented, often non-linear tactics that are essential in establishing urban stability and security.

Post-Katrina New Orleans exposes a city that has undergone a long process of recalibration of its structures and ordering principles in order to allow the emergence of new social and urban forms. The three categories - context, sociality and agents, listed above as a key to understand post-disaster resilience, offer an opportunity to read the local context while providing a shared platform for the subsequent architectural responses illustrated in this paper as prototypical strategies for resilience and catalytic urban processes (Fig.1).

In the field of urban studies and urban ecologies, studies of post-disaster recovery have increasingly focused on “adaptive capacity”, “self-organization”, “diversity”, “transformability”, and “resilience” as main factors that explain the variation in pace and trajectory of rebuilding (Dietz, Ostrom, Stren, 2003; Grimm, Redman, 2004). In this conception, recovery rates vary according to the degree to which the system can build and increase the capacity for learning, self-organization, renewal, and innovation when faced with disturbances (Adger, Huges, Folke, Carpenter, Rockstrom, 2005; Berkes, Colding, Folke, 2003). Since 2005 New Orleans has been a fertile ground for testing ideas and scenarios for effective use of political, economic, cultural and natural resources for recovery, transformation and innovation (Campanella, Gotham, 2013).

Declared as one of the worst natural disasters in American history, Katrina has completely reshaped the image of the city and its forms of use and inhabitation. With billions of dollars of property damage, with the displacement of the vast majority of the population and the dramatic change of the natural equilibrium, the city has faced the challenge of dealing with the constant reinterpretation of what the notion of context may be. Nowadays this is still a precarious parameter, trying to establish clear actions for recovery and resilience. Over the years, a number of urban strategies have been set in place dealing both with the contextual macro-region and the small neighborhood scale. The future vision for the city continues to be compromised and negotiated with the general role of planning in
making the reconstruction efforts viable. The context, to date still fragmented and in some cases discontinuous, continues to claim the need for a holistic approach and a comprehensive urban strategy. In some instances, the merging of top-down and bottom up approaches have allowed to re-stitch the context as whole and integral; in other cases this process is still in progress. It is a hard task to provide an overarching image of what New Orleans is ten years after the storm, but the devastation has slowly turned itself into opportunities for change. As the city had for decades battled to shape and control actions along lines defined by race, neighborhood, income, and other factors of difference (McMichael Reese, 2014), the overall rebuilding process has turned into larger platform where discussions over contextual responses have been only one of the many parameters to take into considerations. The ecosystem dynamics and the social transformations alongside with the political arena, have collaborated to the construction of the intricate system of responses towards a future resilient urban vision. Ten years after the storm the social ecosystem of the city has changed and still continues to change. As young urban rebuilding professionals took leave from their jobs and headed south to contribute to the rebuilding effort, a second wave began arriving enticed by the relatively robust new economy compared to the rest of the country. (Campanella, Gotham, 2013). These newcomers, more specialized and skilled, managed to establish new emergent economies throughout the city and the region. On the other hand, a large part of the population is still not back and it is almost impossible to discuss those terms without thinking about issues of race, class and large socio-political forces at play. The underlying dynamic that has kept the city in steady decline for fifty years is a “social trap” – the inability of government, business, and civic leaders to negotiate with integrity across racial, religious, and class lines to bring into being a city that works better and more equitably for all groups (Rothstein, 2005). These considerations make the current social ecosystem heterogeneous and not easy to portray as it evolves with the continuous capacity of the city to adapt and self-organize. At the same time new forces have been growing in the city as agents for change. Since 2005 a new category of entrepreneurs, creative types, advocates, and more, have found their way into the urban fabric, establishing non-profits, social entrepreneurship programs, community organizations, and more. These new bottom-up forces have produced a solid ground for a series of renewal processes driven directly from the citizens and for the citizens. They have propelled new forms of organizations that have contributed substantially to the urban transformation by starting new programs entailing both the physical transformation of “places” as well as the social-ecological systems around them. The evolving social ecosystem continues to generate an array of diversified categories of people that act as agents for the construction of new communities. For instance, some of the people who came to New Orleans only for the rebuilding process have decided to remain to make the city their
home; others such as long-term residents, who also helped in the rebuilding, have created new social ventures and established platforms to tackle pressing urban issues. The city is re-imaged collectively, where all the efforts and challenges as well as the benefits are shared and participated in. The definition of what ‘urban commons’ are and what they entail for a city as New Orleans is the challenge and opportunity that lie ahead. The success of future urban space will be shaped by its physical layer as well as the cultural, social, economical and political forces surrounding it, always continuing to capitalize on the power of the commons as it has happened in the last ten years in the rebuilding process. The series of case studies presented in the following section have been chosen as prototypical interventions that have acted as catalyst for resiliency in the city of New Orleans, while being at the same time able to be the carrier of the notion of context, sociality and agents within one architectural response.

**Architectural Responses for Resilience**

The subsequent commitment of placing equal value on partner expertise, strengthening ground-up resilience and adaptive capacity while informing and shaping policy has resulted in the collaborations aiming for increasing resilience at the community, state, and regional scale. In New Orleans, the need for regional remediation in conjunction with the urgency for post-Katrina solution-finding has led to the development of numerous architectural responses at varying scales, including several municipal and federal reconstruction plans with varying degrees of success. In conjunction with the idea of **shared space** five individual case studies are presented here, based on the categories **spontaneous/micro, aggregative/medium and perpetual/macro** measuring specific aspects of resilience through differently scaled implementation strategies within social and cultural settings. They investigate the contextual relationship to water, issues of preservation and progress, urban void space and blight utilizing the power of collective memory and existing community structures to implement successful community rebuilding. Located in under-privileged areas of the city these case studies exemplify how stakeholder input at the individual and small-group level, if orchestrated correctly can lead to the revitalization of neighborhoods and the (re)activation of communities.

1. **HGM&F – accessible multi-scalar food production [spontaneous/micro]**

   Located in a neighborhood badly damaged by Hurricane Katrina, the Hollygrove Market and Farm (HGM&F)\(^1\) demonstrates community food engagement in an area of the city long abandoned by full-service food retailers (Fig.2). The goals for the project revolved around neighborhood revitalization and recovery, aiming at the accessibility to healthy food and food
production for a context that although historically connected had been damaged and rendered discontinuous. Support for local farmers, extension of green spaces throughout the city to establish a network of community gardens and green surfaces, soil bioremediation, filtration of toxic urban run-off and fostering of local ecologies can be seen as an integral part of small scale food production. Showcasing a successful model for rehabilitation of blighted and vacant urban space, along with long-term commitment to organizational capacity building through local agents (such as the New Orleans Food and Farm Network), rather than top-down policies, the project demonstrates synergies possible between food security and environmental stewardship, promoting awareness of sustainable growing and living beyond neighborhood borders. Initiated by a small design/build pavilion shared space here is celebrated through the facilitation of knowledge exchange leading to the reactivation of underutilized urban space at the core of a historic neighborhood initially devastated by urban renewal and reformulated through direct citizen engagement.

Fig. 2. Hollygrove Market and Farm.

2. JPNSI – re-compacted urban form [aggregrative/medium]

Building cohesive neighborhoods and enhancing communication and connectivity between neighbors and community stakeholders is likely to improve recovery response (Timothy Beatley, Planning for Coastal Resilience, Best Practices for Calamitous Times). In a city like New Orleans, where blight and decay even before 2005 in connection with ineffectual local governance have been a constant in the urban realm, urban compact form, the densification of the built environment needs to be considered as a means to build up resilience (Berke/Campanella 2006, Planning for post-disaster Resiliency).

Jane Place Neighborhood Sustainability Initiative (JPNSI)² is a New Orleans-based non-profit housing and community development organization, committed to creating sustainable, democratic, and economically balanced neighborhoods and communities utilizing the community land trust model to install responsible land stewardship and shared equity (Fig.3). Initiated by a small grant from a community land trust, historic tax credits and a partnership with a local community development group, four affordable housing units will be provided in a newly renovated building close to new commercial development in a formerly
challenged neighborhood of the city. **Shared space** here functions as a means to promote connectivity between non-profit agents and community beneficiaries as a means to create sustained resilience, with a focus on long-term stakeholder community building.

![Image of Jane Place Neighborhood Sustainability Initiative](image)

**Fig. 3. Jane Place Neighborhood Sustainability Initiative.**

3. **A.L. DAVIS – place making [perpetual/macro]**

   Experience has proven that cultural and social attachment to place and community and related coordinated decision-making will benefit post-disaster recovery. In the adaptive cycle model Holling (1986) identifies the post-disaster period of reorganization and renewal as the ‘alpha phase’, the phase most vulnerable to random development and tactics, but also offering most opportunity for spontaneous and ultimately long-term change. The importance of group-oriented culture (Lance Hill 2006 Miracle of Versailles) in order to guarantee preservation, salvage and also progress of an existing community is demonstrated in the proposal for A.L. Davis Park³. The park is located in the Central City neighborhood of New Orleans, a broken context devastated by the ‘white flight’ movement to the suburbs, aggressive elevated infrastructural systems and overall poor urban planning. It holds extensive historical and cultural significance within the context of the neighborhood and the city. In recent years, A.L.Davis Park has lost value as a community amenity due to post-Katrina de-population, lack of funding, maintenance and an associated growth in crime. As a response the new park layout, envisioned as a series of implementation phases allowing for different funding strategies (through community grants, city and federal funding programs), is designed to be active, user-friendly and accessible to the surrounding community and aesthetically pleasing in order to divert neighborhood crime and violence and re-center the focus on the historically important components of community culture (Fig.4). The comprehensive effort is anticipated as an effort led by longtime neighborhood residents in conjunction with city-wide agencies like the New Orleans Recovery Authority (NORA) and other governmental initiatives who jointly hope to build on the park’s important history in the neighborhood. The design process has included numerous community
meetings and outreach efforts, and the program allocation incorporates many suggestions by the community in regards to activities and infrastructure for the park, taking racial differences and socio-economic challenges into consideration to re-identify place and culture to create a viable social ecosystem.

Fig. 4. A.L. Davis Park.

4. **L9 - adaptive ecology [aggregrative/medium]**

The L9 Environmental Learning and Research Center aims to centralize community leadership, organize community outreach and connect visitors with their natural and built surroundings. The aftermath of Hurricane Katrina with its subsequent failure of the federal levee system left the Lower Ninth Ward neighborhood of New Orleans, situated between the Mississippi River, the Industrial Canal and Bayou Bienvenue devastated and its population decimated. The L9 Centers main goal is to capture the attention and imagination of the local and extended population, fostering civic engagement and becoming a regional destination and economic incubator for a neighborhood in the process of recovery and repopulation. (Fig.5). The buildings proposed site is strategically located at a corner opposite of Bayou Bienvenue, a former cypress swamp destroyed by man-made saltwater intrusion from the Gulf of Mexico, at the lowest edge of the Lower 9th Ward. As the last eastward expansion of New Orleans, the Lower 9th Ward holds a rich tradition of neighborhood culture and community activism immersed in a network of complex natural and manmade systems. The new center will attract visitors and local residents alike, providing access to educational and research programs, water management demonstration, wetland plots and other educational components. The connection to Bayou Bienvenue is further strengthened through a dock along the bayou shores to allow for larger groups to experience ecology and environment and a wetland park featuring water collection and storage infrastructure with constructed wetlands and marshes serving as recreational space. The importance of this project lies in understanding the engrained value of a historic neighborhood confronted with the challenges of racial divides and post-disaster recovery as a means for building up social and environmental stability.
5. Coded Space – urban void strategies [perpetual/macro]

Coded Space\(^5\) investigates the application of a repetitive spatial code that considers plasticity, reciprocity and redundancy at its core in order to address the revitalization of void spaces created by the drastic infrastructural implementation of the Pontchartrain Expressway and negatively affecting communities surrounding them. Using a multi-scalar framework to connect macro and micro components the code allows for the systematic implementation of a multiplicity of programs loosely divided into the categories of exchange, path, recreation and productive infrastructure (Fig.6). At the macro level a cohesive system of programmable plots and connective tissue generates a sequence of repetitive elements that can be altered or combined depending on placement within a site to ensure spatial continuity and to maximize the use potential for the surrounding community. In conjunction with the macro a malleable micro scale is identified through a combination of three categories surfaces (ground), poles (verticals) and canopy (ceiling) that function as flexible elements, able to absorb as well as adapt to external forces applied by site, context and user. Expandable ground conditions, adjustable vertical connectors and a responsive canopy system create a new type of reactive environment that can be geared to site-specific and contextual challenges.

Generally seamless connections to the surrounding neighborhoods are as important as the development of a dynamic environment with the ultimate goal to encourage community empowerment and revitalization. Interaction of the residents with the new public shared space, ranging in scale from small community garden plots to large recreational areas and connective pathways, significantly enhances the existing public realm and foster civic engagement through community groups and promote investment through local agents. This new public space typology, designed to simultaneously act as community asset and productive infrastructure, balances prescribed systems and unpredictable user and context-determined variables through adaptive response mechanisms implanted into the urban context post-disaster, connecting a fragmented context with local forms of power.
Conclusion

Through the lessons learned from New Orleans and its urban renewal process, this paper aims at providing a perspective of how architectural responses become a force for setting up integrated strategies for resilience taking into account context, social ecosystems, and agents as parameters. As stated: "In resilient systems, networks are interdependent, heterogeneous, collaborative, and functionally redundant, with reserve capacity achieved through duplication, interchangeability, and cross-scale interconnections" (Campanella, Gotham, 2011; Godschalk, 2003) the success lies in the capacity of generating scenarios that develop a capacity for learning, self-organization, and through the renewal process, finding a connection between micro and macro urban dynamics.
References


Notes

1 Architectural design for the Hollygrove Market and Farm in collaboration with the Carrollton-Hollygrove Community Development Corporation, New Orleans Food and Farm Network, Tulane City Center, and Tulane School of Architecture students, with support from the Surdna Foundation. DesignTeam: Cordula Roser Gray, Seth Welty, John Nelson, Guan Wang.

2 Architectural design and design research for permanently affordable housing in MidCity through a community land trust in collaboration with the Jane Place Neighborhood Sustainability Initiative, Tulane City Center, Tulane Master of Sustainable Real Estate Development program, and Tulane School of Architecture students, with support from Johnson Controls Incorporated and the Surdna Foundation. DesignTeam: Casius Pealer, Cordula Roser Gray, John Nelson, Evan Amato, Brian Sulily, Andrew Mayronne.

3 Master planning & architectural design for A.L. Davis Park in collaboration with the Harmony Oaks Neighborhood Association, Harmony Oaks Neighborhood Development, Tulane City Center, Urban Strategies
Incorporated, and Tulane School of Architecture students, with support from Johnson Controls Incorporated. Design Team: Cordula Roser Gray, John Nelson, Guan Wang, Allison Powell.

4 Master planning & architectural design for the L9 Environmental Learning + Research Center in collaboration with the Center for Sustainable Engagement and Development, Tulane City Center, Louisiana State University's Robert Reich School of Landscape Architecture, and Tulane School of Architecture students, through support from the Surdna Foundation. Design Team: Cordula Roser Gray, Nick Jenisch, Jenga Mwendo, Sam Naylor, Matt Skoda.

5 Master planning for the infrastructural implementation of the Pontchartrain Expressway sponsored by NOMA, New Orleans. Design Team: Marcella Del Signore, Cordula Roser Gray, Guiseppe Morando, Jonathan Sharp.
Assessing the Adaptation Capacity of Riparian Vernacular Houses in the Face of Climate Change: Can local wisdom be used to improve flood resilience in Ayutthaya, Thailand?

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ABSTRACT This paper discusses the adaptive capacity to flooding of riparian vernacular houses in Ayutthaya, Thailand. The adaptation strategies of vernacular houses, which were refined over time, were the brainchild of local wisdom that embraced flooding rather than perceived flooding as disaster. However, since 1960s, modernisation as well as the introduction of new building technology and materials has affected how people built their houses. This paper investigates the development of riparian vernacular houses and analyses how their adaptive capacity to flooding have changes during the course of this development. The analysis is based on the results of the field survey of the damages caused by annual floods and the severe flood in 2011 to building systems and the results of the interviews with local people. It was found that most vernacular houses could cope with the annual flood reasonably well compared to modern houses but in the 2011 flood when the flood level was around 1.8 metre high the adaptation capacity of vernacular houses was drastically reduced. In the face of climate change, this 25-year return period of 2.5-metre flood may be shortened to 10 years in the future. This suggests that the local wisdom, particularly in terms of the characteristics of vernacular houses, may be used to improve resilience to annual flood but when confronted with climate change, some modifications are required to improve the adaptive capacity of vernacular houses.

KEYWORDS: Vernacular houses; flood; climate change; resilience.

Introduction

Ayutthaya province is located in Chao Phraya River Basin in the central region of Thailand which is influenced by several rivers and canals. Every year, the region is affected by annual floods. Lately, due to heavy rainfall as a result of climate change and poor water management, floods in this region have become more severe. Extreme floods occurred more often with higher flood level and longer flood duration. In 2011, Thailand encountered its worst flooding in half a century; 2,329 houses were completely destroyed, while 96,833 houses were partially damaged (Thailand Integrated Water Resource Management, 2012).
Most of these houses were located in the central region of Thailand. Climate projection has suggested that heavy rainfall is very likely in the central region and its upstream area. This could lead to more floods in Ayutthaya.

The riparian vernacular houses, known as the traditional Thai houses, were created from the relationship between people and water environment. These houses have been developed for a long period of time and were therefore considered to be appropriate house types to cope with seasonal floods. However, due to globalization and the declined relationship between people and water, these riparian vernacular houses have been changed to be more modern styles which are not designed for flooding. In a changing climate where floods tend to be more severe, Can local wisdom be used to improve flood resilience in Ayutthaya, Thailand? The aim of the research is to analyse the adaptation capacities of riparian vernacular houses with floods in the present and future situations. The research used Rangcharakae, a riparian communities in Sena District, Ayutthaya Province as a case study.

Rangcharakae community

Rangcharakae community is an old rice farming community that has existed since the late Ayutthaya Kingdom around 250 years ago. It is in the northern part of the Sena District, 28 km from the centre of Ayutthaya Province. The area is a vast low land of clay soil which is most suitable for rice cultivation. Flooding occurs annually to a depth of 1-2 m. The rainy season is from the middle of April until the middle November. Floods start in September; a lot of water from the Northern part of Thailand flows down and fills every water course of the central plain area. Water overflows from Rangcharakae canal through fields. The highest flood level is in November and then the water level starts reducing in December until February, when the earth will be completely dry. Communities are strung out in linear settlements along the banks of Rangcharake canal and its branches. In the past, most of the houses were placed next to the stream. After the 1970s, roads were built parallel to both sides of the stream; the majority to new houses are built closer to the road.

Development of riparian vernacular houses and relations with water environment

In order to understand the development of riparian vernacular houses in Rangcharakae community, all houses in the case study area (n=390) were examined in terms of their styles and ages. The house styles are summarised in Table 1. The traditional Thai house was the typical riparian house in the community for hundreds of year before modernisation took place. This vernacular wooden house was built on stilts to avoid floods. The columns and walls of the upper floor leaned inward to provide a stable frame structure to resist currents during flooding. (Chaichongrak, 1975) A high steep gable roof structure helps to drain water
fast. The house was constructed using a mortise and tenon joint system which is flexible during flood period. Most traditional Thai houses were placed on the canal banks. Since the 1960s, the impact of modernisation on vernacular house forms began with the traditional Thai house being adjusted to become the modified traditional Thai house and a new house type being created, called the low-pitched roof house. These vernacular houses still exist along the waterway, but commonly have entrances from roadside as well as water side. Recently, house styles have been varied due to the influence of urban life from Bangkok. Wood has become more expensive and rare so concrete was the popular choice of the new vernacular house. The stilt concrete house makes use of a vernacular form but using concrete as steel as building materials. The low-pitched roof two-storey house is half wood half concrete. Building materials are a mixture of wood in the upper part and concrete in the lower part. The modern traditional Thai house is also half wood half concrete but the upper part comprises wooden traditional Thai building units. The next generation of house found in Rangcharakae is the modern concrete house being one or two storeys. This new house type copies the style from housing estates in Bangkok. This house style is usually found along the road side rather than the waterside.

**Analysis of adaptation capacity**

The research compared the adaptation capacity of houses based on the flood damage and the percentage of uninhabitable space during flooding. The flood damage was based on interviews with local people and a detailed survey of 146 houses in Rangcharakae community and their damages caused by annual and extreme floods. The eight house styles are grouped into five major types, according to their materials and constructions in the adaptation capacity comparison. The five major types of houses are 1) wooden stilt house which includes traditional Thai house, modified traditional Thai house and low-pitched roof house, 2) concrete stilt house, 3) one-storey concrete house, 4) half wood/half concrete house which includes modern traditional Thai house and low-pitched roof two-storey house, and 5) two-storey concrete house.

Houses in the community are surveyed for their damage to structural, architectural, mechanical, electrical and plumbing systems. According to the fact that houses in the riparian community generally have similar plumbing, electrical and mechanical systems, damage levels to these systems were later dropped from the analysis. The survey recorded damage to architectural and structural houses using 5 categories ranging from 0 = No damage to 5 = Destruction. The damage levels to different structural and architectural elements were recorded, and then averaged to find the arithmetic mean for each major house types.
Table 1. Summary of house styles in the Rangcharakae community.

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<td>Modified traditional Thai house</td>
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Adaptation capacity to annual floods

Fig. 1 compares the adaptation capacity of various house types in the riparian community to annual flood of the average level of 1.27 m. The X-axis represents the average damage levels to structural and architectural elements of the houses. The Y-axis represents the percentage of the uninhabitable space in the house. Note that people in the riparian community normally will not evacuate from their house in the time of flooding. They live with flood provided that there are reasonable amount of space above the water. The size of each circle represents the percentage of the houses in the community built in the particular style. A house with more adaptation capacity or more resilient to flood will be located in the bottom left of the chart. That is, during flood, there is less uninhabitable space and less damage to the house. Considering that when there is flood, a house should be able to withstand the flood with no damage and 50% of its space should be accessible, the study have set up a safety zone in the bottom left of the chart. Ideally, all houses in the community should be located in this area to be resilient in terms of flooding.
It can be seen from Fig. 1 that majority of the houses in the riparian community has negligible damage from the annual flood at the average level of 1.27 m. But the percentage of uninhabitable space is depending on the style of the house. Occupants of the stilt houses can only access the area of the raised floor and occupants of the two-storey houses can only access their upper floor. The only house style that is vulnerable to annual flood is the one-storey concrete house. The average level of the ground floor at 0.85 m above grade is not enough to cope with the 1.27-m annual flood. Considering 89% of the houses are in the safety zone, the riparian community are quite resilient to annual flood.

Adaptation capacity to the severe flood in 2011

The 2011 flood was Thailand’s worst flooding in 50 years. In the case study area, the average flood level was 1.77 m. Fig. 2 summarises the adaptation capacity of the five house types to the flood. It is clear that the adaptation ability of houses is reduced from the case of annual flood in Fig. 1. Overall, the vernacular house styles with stilts are more resilient with less damage and less uninhabitable space. Considering the safety zone, around 20% or 1 in 5 of houses in the riparian community are vulnerable to floods of this severity.

Climate change scenarios and future flood risk in the case study area

Floods in Chao Phraya river basin are caused by various factors including topography, amount of rainfall in the area and upstream area, sea level rise, human activities and water management. Among these factors, the amount of rainfall in Chao Phraya river basin and the upstream area and its return periods could be forecasted using climate projection models. The current study used several atmospheric general circulation models including ECHAM4 (A2&B2), ECHAM5 (A1B) and HadCM3 (A1B) in climate projection. The detailed climate change projection was generated using PRECIS, a regional climate modelling
system developed by Hadley Centre, the Met Office, UK (The Met Office, 2013). This part of works was done by South East Asia START Regional Center (SEA START RC, 2013). The ECHAM5 (A1B) model/scenario, the worst scenarios with the 5% increase of rainfall, was chosen. Based on this model and scenario, the return period of 1500 mm rainfall could change from 25 years to 10 years. This contributes to the flood risk in the Chao Phraya River Basin.

The occurrence of floods and floods risk of the Chao Phraya River Basin was studied by Jarupongsakul (2000). The study developed the flood risk map of the area at scale 1:50,000 from the meteorological, hydrological, and satellite data. According to the map, in the 10-year flood, the flood level in the case study area could reach 1.5 m and in the 25 year flood the flood level could reach 2.5 m. From the climate projection which suggests the changing return period of rainfall from 25 years to 10 years, it is possible that the return period of flood would change in the same pattern. Therefore, 10-year flood level of 1.5 m was used as the scenario of the present 10-year flood and the 25 year flood level of 2.5 m as the scenario of the future 10-year flood. It should be noted that the purpose of the study is not to predict the exact level of the future flood but to establish the potential scenarios for studying the adaptation capacity of various house types in the community.

**Adaptation capacity to the present 10-year flood**

The level of 10-year flood at 1.5 m was used to estimate the damage to structure and architectural systems of the houses. The estimation was based on the extrapolation of the damage caused by annual flood at around 1.27 m and the extreme flood at 1.77 m in 2001. The average levels of damage from 1.5-m flood and the percentage of uninhabitable space are summarised in Fig. 3. The style of the house with minimum damage is the concrete stilt house, followed by the wooden stilt house, two-storey concrete house, two-storey half wood half concrete house and the one-storey concrete house. It can be seen that the traditional wooden house and the stilted house which are built in vernacular style are more resilient than others. Fig. 3 also shows that around 90% of the houses in the community are in the safety zone. The flood of this level barely causes any damage to these houses. The only one house type that would suffer from the 1.5-m flood is the one-storey concrete house. Houses built in this style will be uninhabitable and begin to have some damage, making them most vulnerable.
Adaptation capacity to the future 10-year flood

Fig. 4 summarises the estimated adaptation capacity to the future 10-year flood at 2.5 m level. It can be seen that the damage levels of different house types are much higher. Most houses in the community will suffer from damage in various parts of the house. The house type with minimum damage is still the concrete stilt house. Houses built in this style will be flooded but after cleaning, the house can be occupied as normal. Other houses will require more restoration before occupation. The two-storey half wood half concrete house is the house type with the most damage. It should be noted that the flood at this level is higher than one storey so virtually all houses in the community will be uninhabitable. In order to overcome flood at this level, the height of the raised floor in stilt houses must be higher than usual (approximately 2.1 m). It can be seen that the adaptation capacity to the future 10-year flood is much different from the adaptation capacity to the present 10-year flood. With 1.5-m flood, 90% of houses are in the safety zone that is majority of the houses can cope with the flood. However, with 2.5-m flood, no house can cope with flood. This leads to the vulnerability of the community: the people in the community will have nowhere to live and after the flood, the restoration of the houses will be a major financial burden to the people in the community with the average income of 12,200 Baht/month/household (around 250 GBP). Living in damaged houses will affect their quality of life and possibly their health.

Discussion and conclusion

Based on the surveyed damage to houses from previous floods, and the estimated damage to houses from flooding using climate change scenarios, the vernacular houses with a raised floor (Stilt wooden house and stilt concrete house), as one shown in Fig. 5, are more resilient to flooding than other house types. This suggests that the local wisdom in building stilt houses actually improves resilience to annual flood in Ayutthaya. The result justifies the
existence of stilt dwellings in Southeast Asia, Melanesia, the Caribbean and coastal areas of
the southern United States, northern Latin America, isolated regions of Africa and Inner Asia
(Vellinga et al., 2007) which are also flood-prone areas. Stilt houses minimise the
obstruction to flood flows, keep people from contact with floods, offer protection from
rodents, pests or ferocious animals, allow ventilation and defend residents against intruders.
However, in face of the changing climate, upgrading is required to improve the adaptive
capacity of stilt houses in dealing with the severity of future floods. The analyses using the
climate modelling systems and the flood risk map have indicated that the typical height of a
raised floor of stilt houses around 2.1 m may be inadequate to cope with extreme floods in
the future.

Fig. 5. Traditional Thai house during flood season.

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Session 15

Cultural Resilience and History

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ABSTRACT The aim of this paper is to analyse citizens’ strategies for surviving dangerous wartime urban conditions in Sarajevo, as made evident through different documents—photos, videos, and architectural drawings—produced by many authors during and after the war. Heterogeneous in its materiality, this study relies on the personal and professional experiences of each citizen-author. It sketches the social and physical components of the city, at a time when the urban environment was made perilous due to bombing, and a lack of public transport, electricity, water, and food. In the period between 1992 and 1996 in Sarajevo and in other Bosnian cities, survival became the most important activity for citizens. The inability of the city and the people living in it to function normally demanded as they developed innovative surrogates for the everyday objects not available to them—invected objects for cooking, lightening their spaces, sleeping, and self-protection. Likewise, they developed alternate models of the safe transportation of goods, along with other urban functions. Their war documentation is extremely important, as Sarajevo’s destruction, which quickly transformed the pre-war, compact city into the ruin—was and continues to be difficult to describe and represent. Using Sarajevo as case study, this article examines the importance of collective creation of documents about citizens’ adaptation to extreme urban conditions as well as their contribution to the emerging studies on war architectural and urban resilience. Considering these documents is central to the formation and maintenance of a collective memory, as citizens undertake post-war reconstruction efforts, as artists develop materials for art projects on the urban wartime conditions, and as scholars craft academic research about the war across disciplines—architecture, urbanism, anthropology and media. This article takes media expressions as methodological tools for the reading and analysing war urban transformations and citizens’ resilient efforts. The aim is for these studies to be used as well for other urban emergencies, such as crises due to natural disasters or the shrinking cities.

KEYWORDS: Collective documenting; war; media; Sarajevo; urban resilience; extreme urban transformations.

Introduction

In the last war in Bosnia and Herzegovina (1992-1996), the capital city Sarajevo suffered an unprecedented siege, often noted as the longest siege in modern warfare. In the course of 1992 Serbian forces positioned their tanks on the hills around Sarajevo and snipers in tall
buildings located in the occupied Grbavica neighborhood of the city. In addition to the reports generated by local and international media operators, citizens were actively engaged in documenting the war and their methods for survival in the city. Due to the constant bombing and the aftereffects of such destruction, Sarajevo's wartime situation was extremely dangerous for the life of the citizens: they had to adapt to the living in destroyed flats, with UNHCR plastic foil on their windows instead of glass, lacking electricity, water, and food, and often sharing daily life among neighbours of the same building in their collective underground shelters. The city of Sarajevo was a battle terrain and its citizens were part of it all the time. Every day the city was hit by some 4000 shells on average; among the targets were hospitals, schools, mosques, churches, synagogues, maternity hospitals, libraries, museums, open-air and sheltered food markets, and any place where people stood in line for the limited supplies of food, bread and water (Bollens, 2001). Survival became the most important activity for all citizens, and “the city, although unsafe, became a survival resource itself” (Pilav, 2012). Due to these spatial-social conditions, many citizens felt an urgency to take risks in order to describe, document, and represent daily life during the siege. The siege of Sarajevo has been documented by many different authors, because every part of the city had witnesses of the war: non-specialists (citizens) who made amateur videos, diaries, photos, and fax correspondences, as well we specialists, such as architects, photographers, and film makers. In studying wartime urban transformations through the various materials, media, and data described above, I have learned that to comprehend and represent such an extreme urban condition demands an interdisciplinary approach to research that integrates documents made by many authors. I consider city of Sarajevo as the physical material of the research, while the documents made during the war are “cultural materials” (Simone, 2007; Ulmer, 1994) for the research. Documenting of the war using different tools and media products creates images of war. In addition referencing the mediums of these cultural materials (photos, videos, maps, comics, etc.), I will also use the –ing, or “gerund,” form of these terms, which acts as a noun¹ and represents action. Some of these gerunds already exist, such as mapping, but some of them are words constructions aiming to represent the image making activity, as it is comicing (the drawing of comics). I use these neologisms in order to demonstrate urban processes in which “activity and theory merge into one activity” (Ulmer, 1984). This paper analyses images that represent spatial and social urban resilience during the war, and contribute to the creation of the collective “forms of dialogical visual culture(s)” (Lovink, 2011), as well as spatial. I argue that these images have great importance as materials for collective memory, but also for academic research; post-war urban, architectural, and art projects; documentary and fiction films. Existing images of war and survival have a great impact on those who have no experience of war at all. Moreover,
these documents can help them to perceive and understand the realities of war (Sontag, 2003), such as ways of waging the war, levels of spatial destruction, and citizens’ survival strategies.

**Sarajevo: Urban war, documenting the war, the city as research method itself**


In academic and military literature, the “city as battleground” has emerged as an important and timely subject, particularly in the face of emerging terrorism attacks and urban warfare from the 1980s onward. According to Stephen Graham, next to Sarajevo’s war (1992–1996), urban conflicts such as those in Grozny in Chechnya (1994), Georgia and South Ossetia (2008), and on going conflicts in Israel-Palestine also loom large in current military debates about the urbanization of warfare. I lived in Bosnia during this period, and so observed first-hand the urban physical material that is the subject of this research, and the spatial-social transformations that took place: “the disaster is not the object of explanation, but the subject” (Ulmer, 2004) of extreme urban transformation influencing human living conditions. This paper, relying on collective documenting processes—images of war, shows how war destruction in Sarajevo produced urban and architectural physical materials that further on were used for collective reproduction of the citizens’ survival strategies. Citizens documenting also confirms the argument of Susan Sontag (2004) that “the memory of war, however, like all memory is mostly local.” To describe the material processes of destruction-production-reproduction of the city during the war, I will use architect Zoran Doršner’s term “destructive metamorphosis.”

The collection of war documents that I will be analyzing contains images of war made by the following individuals: Doršner, who contributed to the building of the collective knowledge on war architectural and urban resilience by focusing on spatial physical changes; photographers Zoran Kanlić and Miguel Ruiz; Professor William Tribe who taught for twenty years at the Sarajevo Faculty of Philosophy and made together with the director Dom Rotheroe during the war documentary film ‘Urbicide: a Sarajevo Diary’ (1993), the FAMA collective; and citizens of Sarajevo that I met and interview during my doctorate research. The FAMA collective described new war geography of the city with the Sarajevo Survival Map (Fig.1). FAMA in the introduction to ‘Sarajevo survival guide’ reported that during the siege of Sarajevo, citizens were making their life possible out of nothing while giving some messages for the future. “On the fifth of April, 1992, around Sarajevo, the capital of Bosnia and Herzegovina, which had about 500,000 inhabitants, around the city in the valley of Miljacka surrounded by mountains […], appeared: two-hundred-sixty tanks,
one-hundred-twenty mortars, and innumerable anti-aircraft cannons, sniper rifles and other small arms.” (FAMA, 1993).

As Sarajevo was under siege, certain morphological and topographic features of the urban territory and built environment became more or less conducive to urban warfare, and as such assumed different symbolic and practical significances than originally intended. One critical example: the frontline of urban warfare in Sarajevo divided certain neighbourhoods in two. This was the case in Grbavica and Dobrinja neighbourhoods, where the frontline was established in between and even through the buildings themselves.

**Destructive Metamorphosis**

“And soon the form exhibits subtle change.”


The pre-war city was changing rapidly, due to two parallel extreme spatial action-reaction processes. First, the extreme spatial action: the bombing of the city from the surrounding mountains and hills as drawn in the Survival Map of Sarajevo (Fig. 1). This transformed very fast, due to constant bombing, the planned and compact city into a ruin (Fig. 2, 3), altering
its pre-war urban functions and architecture: public transport, pedestrian paths (Fig. 4), living interior spaces, modes for the provision of the food, and other changes. What followed was an extreme spatial reaction to the ruined and non-functioning city: citizens developed survival strategies, creating collaborative and resilient self-made city, altering urban production on the two vertically-divided levels: overground and underground level (Fig. 5). Some of these reactions included the following: creating urban gardens (Fig. 6), producing innovative objects for cooking, heating (Fig. 7), devising human-powered transportation of different items (Fig. 8), constructing protections against snipers and shelling (Fig. 9), developing new communication tools through the creation of video messages sent between families in embattled and peaceful areas, alternative interior lighting sources (Fig. 10). One particularly interesting wartime invention: a doorbell made using the bullet hole on the flat entrance door using the baby carion. The need to survive introduced new architectural and urban elements—ephemeral and temporary—made by citizens who produced a space and “culture of collaboration,” based on trust and mutual understanding” (Lovink, 2011). In analyzing Doršner’s idea of destructive metamorphosis of the city, I have relied as well on the work of Johann W. Goethe, who dedicated his book Metamorphosis of Plants to metamorphosis in nature. According to the Merriam-Webster dictionary, metamorphosis is “a striking alteration in appearance, character, or circumstances.” Goethe defines metamorphosis of plants as “the process by which one and the same organ appears in a variety of forms” (Millers, 2009). I have employed this term both as an analogy for the metamorphosis of the city during and after the siege.

Fig. 2. (Left) and Fig. 3 (Right) Transition from a compact city to ruin due to wartime destruction. Photographs by Miguel Ruiz (Fig.2) and Zoran Kanlić (Fig.3), 1992–1996.
Fig. 4. Protected and semi-underground pedestrian paths during the war (left). Photograph by Miguel Ruiz.

Fig. 5. Documenting of the life in between overground and underground level of the city. Photograph by Zoran Kanlić (Fig. 5), 1992–1996.

Fig. 6. Urban garden in the Marijn Dvor neighbourhood. Photographs by Miguel Ruiz, 1992–1996.

Fig. 7. Self-made objects for cooking and heating (right).

Fig. 8. Human power transportation objects (right). Photographs by Zoran Kanlić, 1992–1996.
Documenting the war – redesigns for the city and redesigning the city

By analysing the various images of the war and the image-making activities conducted during the war, we can begin to comprehend a fragmented urban territory: ruined, empty, non-defined spaces, which contain structures and objects made by accident and for temporary uses, constructed in emergent circumstances, where spaces and materials are disintegrated. In disaster circumstances, as during the war in Sarajevo, urban changes are rapid, unpredictable, and difficult to control.

As a consequence, the well-established planning and design practices employed by the Yugoslavian government, its planners, state-building companies, public officials and most of the state-supported architects to control urban transformations in Sarajevo ceased to work. Architects and planners accustomed to working in official plans and prints began operating in an imagined and ever-changing world, hidden in their flats and shelters. Several architects were rethinking urban and architectural space, starting from the actual war socio-spatial emergency—building from and with the ruins and attending to the survival needs of citizens. On the other hand, others architects were looking straight to the post-war future, already proposing reconstructions of the existing buildings, and even proposing new structures.

In his proposal for the exhibition Sarajevo Dream and Reality, dating from 20th December 1993, architect Zoran Doršner writes:

Proposal of a theme for an exhibition in New York: To present like a realistic caricature a graphic representation of the typical floor plan of a flat from the newer series of social housing in the scale 1:10 with an emphasis on the metamorphosis of the flat’s interior during the war, including the details of wartime design for dwelling.

Doršner’s architectural work made during the war contains texts, journal articles and working sketches, such as free-hand overlapped drawings of the socio-spatial changes.
taking place in individual residential units from pre-war to war conditions (Fig. 11); and the civilian rescue equipment used for survival during the siege (Fig. 12). From above listed materials he produced more detailed drawings for the New York exhibition, and also included an image of the partially-destroyed building facade of a typical socialist apartment building (Fig. 13); the floor plan of the residential unit before wartime changes (Fig. 14); the floor plan of the residential unit with the wartime changes (Fig. 15); and drawings of the civilian rescue equipment as in the Fig. 12, but adding more objects (Fig. 16). From Doršner’s drawings of the floor plans in the Fig. 14 and 15, we can perceive aspects of citizens’ everyday life during the war in urban conditions, how the pre-war use of the flat has been changed to include new, necessary functionality: wood and water storage; redesigning urban elements, such as terrace garden, sand-bag protection wall; and objects designed using what materials was available at-hand inside the apartment, such as a cooking and heating stove.

Fig. 11. Sketches of the residential unit, documenting the transition from pre-war to wartime living conditions (left).
Fig. 12. Sketches of the wartime design for civilian rescue equipment (right). Working sketches by architect Zoran Doršner, 1993.
Fig. 13. Image of the partially destroyed building facade of a typical socialist apartment building. Photograph by Zlatan Filipović, 1993.

Fig. 14. Floor plan of the residential unit before wartime changes (left). Fig. 15. Floor plan of the residential unit with the wartime changes (right). Drawings by architect Zoran Doršner, 1994.

Fig. 16. Objects designed using what materials was available at-hand in the apartment. Drawing by architect Zoran Doršner, 1994.

Documenting the war – photographs of the city and photographing the city

The Bosnian war and the siege of Sarajevo was the subject of international attention due to the work of local media operators and those from all over the world who were stationed in Sarajevo, producing sensational images depicting civilians injured by sniper bullets, or flaming, bombarded buildings. Contrary to the usual focus on the photography production of “disturbing photographs” (Sontag, 2003), this paper considers and analyses the material destruction of the city and citizens’ response to the war emergency from a selection of photos made by photographers Kanlić and Ruiz. Both were documenting interior, intimate living spaces and significant material changes of the publicly open and collectively shared spaces between Sarajevo citizens, such as streets and protected green areas (Fig. 2-11). Analysing these photos, I found that they documented the same or similar objects and
spatial adaptations to those that architect Doršner drew. Ruiz’s documented wartime gardens (Fig. 6) that citizens made on the green areas in between their housing blocks where during peacetime there had been city parks; people waiting in lines for humanitarian aid (Fig. 17); families growing vegetables on their terraces (Fig. 18), and many other survival tactics. Kanlić in Fig. 7 documented how people, who were living in multistorey, modern-dwelling buildings that had been constructed without chimneys, created openings in their walls in order to install the fume exhausts for an aluminium box stove on the window that they used for heating and cooking. In Fig. 19 and 20, he documented acts of cultural resistance to the siege, such as a concert at the music academy in a room riddled with holes from shelling and an art exhibition installed in the burned central post-office.

Fig. 17. Waiting in line for humanitarian aid (left).  
Fig. 18. Growing vegetables on the terrace (right).  

Fig. 19. Concert at the music academy in the room with the wholes from shelling (left).  
Fig. 20. Art exhibition in the burned main post-office (right). Photographs by Zoran Kanlić, 1992–1996.
In 1992, when war in Bosnia had just begun, in that time a commander of the police special forces Dragan Vikić (Fig. 21) during a TV news broadcasting, implored Sarajevo residents to film from their windows the war transpiring in their neighborhoods. Many citizens did film their city during the war, no doubt some of them directly heeding Vikić’s call. In 1996, Sead and Nihad Kreševljaković began collecting and reviewing such filmic materials and made a video archive of 500 hours of amateur-videos, all in different video formats, quality, duration and made by different citizen-authors. Together with a friend Nihad Alikadić, the Kreševljakovićs used this archive to create the documentary film Do You Remember Sarajevo?, which was completed and first shown in 2002. That same year, the weekly magazine Dani (Days) interviewed the documentarians and reported, “about one hour of remembering the times which had conquered pride, where just like in the movie, all emotions had been combined: horror, suffering, humor, everything what has touched the besieged city, creating a unique atmosphere in the history of the world.” In the interview, the filmmakers explained that the movie doesn’t show a single story of one or more main characters and their lives. On the contrary, it attempts to represent every citizens and his or her life during the war. Moreover, according to Nihad Kreševljaković, from 500 hours of video materials, anyone could make a different movie. The amateur videos showed citizens filming from their windows the bombing of the city during the day and night, the compact city
turning into a ruin, the citizens’ architectural adaptations of the interior spaces to the wartime living conditions, soldiers moving in and around the city, wartime design inventions, and even entertaining moments during the war. The filmmakers also note that for this documentary, instead of actors, the video camera is in the foreground. As a medium, a film captures moving images, and thus preserves the condition of the man who is filming, in this case, the rhythms and tensions of the living in the wartime city. Since videos were made by many authors, different video formats were used: 70mm, 35mm, super 16, 16mm, super 8, 8mm, betacam sp, mini DV, etc. I argue that film and video in relation to the discipline of urbanism centered on the extreme urban context – war destruction and as consequence fast urban transformations are highly relational media. By compiling such various media, collected over the duration of the war, the documentary is able to show how the forms and uses of space change over time during the war. The film captures intimate, individual wartime experiences of the filmed people and their related urban environments, a series of spontaneous everyday moments. In addition, ‘Do you remember Sarajevo?’ is interesting as the media research tool: as an example of collective film making, as evidence of shared documentation of extreme urban transformations, as an “intellectual instrument” (Ulmer, 2004) for academic research about wartime cities, and finally as a visual reading of the complex urban terrain.

**Conclusion**

When the war destruction begins, simultaneously begins the processes of the rescaling the urban habitat through citizens’ various, innovative reimaginings of their homes. Relying on this fact, I initiated my research on the war architectural and urban resilience in Sarajevo via the analysis of the single, mid-size family residential unit using architect Doršner drawings, because in wartime everything that happens actually unfolds within that limited area. While the city still somehow functioned as such, most of the functions of its residents were circumscribed within the four walls of their apartments. This compressed space represents the material base for the social-spatial reproduction of Sarajevo and its territory during the war. In my view, the idea of destructive metamorphosis proposed by Doršner represents a complex documenting process of the death of the city, its reconstruction, reproduction of space and life in the same time through “metamorphic process” not unlike the one proposed by Goethe that has the ability of “going backward as well as forward” (Miller, 2009). Beside a relevant documenting example of the war destruction of the city and architecture, Doršner drawings shows how interior spaces and each object “was an adaptation of some already existing object, partially changing its original shape and giving it a new and different use as well” (Pilav, 2012). From this process of the construction-
destruction-reconstruction of the city during the war, new images emerged of the future of Sarajevo. In addition, Doršner perceived the war experience of Sarajevo as a model for future studies of cities experiencing analogous conditions. In his exhibition text, he writes: “Documenting is terrifyingly didactic for the eventual new subjects at the faculties of law, philosophy, political sciences, architecture—about civilian resistance against the endangerment of elementary rights to life, freedom, peace, home, privacy, culture, religion, universal human rights, and achievements of civilization. This experience may also serve for a new section of the famous encyclopedia for architectural standards of Ernst Neufert, a tragic section of the book dedicated to the elementary survival of cities and civilizations that are under the process of deliberate destruction” (Doršner, 1994). Although in 1991 the World Wide Web had already been introduced, and the war in Sarajevo started the following year, the conflict was documented using old media formats: texts, fax machines, photographs, hand drawings, journals, and video. Wars of today are documented and their images dispersed using both old and new media, such as web mapping, 3D models, interactive websites, smart phones as “witness devices” (Lovink, 2011), making images and videos using the built-in camera that often are uploaded at the moment of filming to YouTube, Twitter, Facebook, other social networks, or individual blogs. According to Stephen Graham (2010), “the invasion of Iraq in 2003 ‘was the first war to emerge in the electronic informational space as a fully coordinated “media spectacle.”’ In addition, the commercial news media have appropriated their own digital simulations of cities and spaces where wars are happening (Graham, 2010). Note that evident technological and electronic advancement of the contemporary warfare is hardly contributing to the documenting and understanding of how citizens are adapting to wartime urban conditions. In war Sarajevo, citizens’ resilient practices were changing architecture day by day, in its form and functions, while introducing spatial ephemerality and different architectural aesthetics through reparation of ruins, grenades holes, and adding of new architectural elements (i.e. sand bags, water collectors, metal sheets from cars). Each building has been transformed, and some trivial or hidden functions of it – staircases or underground storages became safe zones for everyday life reproduction based on collectivity and solidarity among citizens. “It is difficult to consider that urban resilience could be a universal concept. It can vary depending on national policies, disaster history, and security priorities of every country” (Pilav, 2012), but I argue that resilient practices devised by citizens experiencing one war may be useful for those suffering in other conflict zones and contexts. Therefore, collective documenting of the war in the city is highly important image-making process to capture the evidence of war. Analyzing documents from the Sarajevo war shows “radical transformations” (Lebbeus, 1997) by the people who are facing the war everyday with their survival tactics and production of the
patterns of urban resilience within single spaces and the city reconfiguring war urban situation through local cases. In relation to this, I assumed that the pattern of urban resilience is combination of creative and innovative spatial practices found in everyday life, social rules and values, and adaptive thoughts on disaster risk within that specific urban environment (Pilav, 2012). The local instance becomes the scene of change (Ulmer, 2004). Finally, what is possible to learn from the collective knowledge about the war in Sarajevo is not reduced to a media laboratory of sampling, coping, juxtaposing, and recycling of physical and cultural war urban materials. On the contrary, Sarajevo has been a field for forced spatial experimentation, difficult life experience and inventive praxis that today, after the almost twenty years after the war, can continue to be ground for the production of common and “relational knowledge” (Sartre, 2004) that later can be compared with and often employed using the same or similar survival tactics within some other extreme urban situation of war or natural disaster.

References

Notes


2 Gregory L. Ulmer in his text “A-Mail: Differential Imaging” (2004, p.125) sees disaster (not specified which) and homelessness as a method, as a subject to learn from it. “Such is the method: homelessness is not something to explain”.

3 The term has been used and ideated by the architect Zoran Doršner in his proposal for the exhibition ‘Sarajevo Dream and Reality’ which was set up for the 1995 show at the Storefront for Art and Architecture gallery in New York. Urbanists, architects and students of architecture from Sarajevo that were working on their ideas and projects during the war took part with their projects in this exhibition, which was organized by Association of Architect of Sarajevo.

4 FAMA (“report” in Latin) is an independent production company founded in the prewar period, worked primarily in audio and video media. It was the organization that produced the Sarajevo Survival Guide and Sarajevo Survival Map. Survival Guide was written in Sarajevo between April of 1992 and April of 1993. The contributors of the Sarajevo Guide are: Miroslav Prstojević (text), Željko Puljić (photos), Nenad Dogan (design), Maja Razović (editor), Aleksandra Wagner (editor and translator), Ellen-Elias Bursać (translator). The contributors of the Sarajevo Survival Map are Suada Kapić (author), Ozren Pavlović (graphic designer/illustrator), Drago Resner (photographer), Nihad Kresevljakovic (text author), Emir Kasumagić (editor), and Vanja Matković (translator). Today FAMA is registered as FAMA International and FAMA Collection represents a virtual bank of knowledge dedicated to the Siege of Sarajevo 1992–1996.

5 To see creation of the video messages and the war design inventions watch documentary film “A Sarajevo diary—From bad to worse”. Author of the film is William Tribe who thought at the Sarajevo University for twenty-six years, until the war started.


8 This is my interpretation. He didn’t precise in his invitation to the citizens what to film.


Looking into the Changing Rural Vernacular Dwellings with a Sustainable View: A case study on Bingzhongluo township in southwest China

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ABSTRACT The valuable pristine nature, multi-ethnic, religious culture, and biodiversity of Bingzhongluo Township have spurred its reputation as a “Primitive Paradise”. Bingzhongluo Township is located in the upper region of Salween in the mountainous and needy rural area of Southwest China. The representative log-construction vernacular architecture and unsophisticated settlements fully translate local harmonious social relationships and regional folk culture into physical space forms. However, the majority of academic studies on vernacular architecture in Bingzhongluo typically focus on the traditional aspect, ignoring the silent but dynamic changes influenced by corresponding economic, social, and environmental development. Moreover, the Chinese government has invested a significant amount of human, physical, and financial resources and is preoccupied with execution policies on rural development, aiming at sustainability but selecting a modernization model as a general strategy. Impelling political instruments induces the mass destruction of traditional villages and the large-scale construction of New Socialist Countryside. Inadequate and off-subject research output on Bingzhongluo could not build interaction and application links for governance. Therefore, regional-scale vernacular architecture research and adaptability of policy should be reconsidered. The endogenous development paradigm is operable in constructing sustainable rural Southwest China according to its specific complicated topography and vulnerable development. Rural Built Environmental Sustainability Assessment System (RBESAS), which is based on endogenous development criteria and sustainability scope, has been established for this region. This study used RBESAS to qualitatively evaluate local self-reliance and development capacity in built environment in Bingzhongluo. Furthermore, questionnaires on vernacular architecture were distributed to conduct “bottom-up” intensive field studies in a typical area in Qiunatong Village of Bingzhongluo. This study performed a sustainability-oriented analysis on built environmental circumstance and vernacular architecture to give several significant responses to renewal issues in Bingzhongluo.

KEYWORDS: Vernacular Architecture; Dynamic Changing Process; Endogenous; Bottom-up; Policy.

Introduction

In Southwest China, vast log structures are dispersed in the dense woodland of the Three Parallel Rivers Property regions in Yunnan Province, where the vigorous biodiversity and
multi-ethnic settlement culture are highly recommended at international level. Bingzhongluo Township is a valued area in miniature. However, relentless modernization in this small town will soon bring more destruction rather than contribution to the environment, society, and culture before research on local vernacular architecture becomes mature. This paper provides an overall picture through sustainability-oriented studies that consider the changing process and dwellers to determine meaningful research approaches, and then ultimately enhance the sustainable development of vernacular architecture in Bingzhongluo.

Background and problems

Bingzhongluo Township, an area of 823 km² with beautiful natural scenery and typical vernacular settlements (Wu 2013), is located at the northern Salween riverside in Gongshan County of Nujiang Lisu Autonomous Prefecture. It is an important core zone of the Three Parallel Rivers Property in Yunnan Province, Southwest China. Human settlements in these regions are divided by steep gorges and glaciated peaks (UNESCO 2015). In Bingzhongluo, log-construction villages are typically located in the stable alluvial fans beside Salween, or at the bottom and middle of the mountains around the river. Infrastructure, sclerotic roads, electricity, running water, and broadcast had not been constructed in numerous remote village groups until 2010. More than five different minority groups live in this region, believe in more than five religions, and show multiple and porous social relationships (Wu 2013). All of these characteristics highlight the value of vernacular architecture research in those regions. However, a systematic investigation on this dimension is scarce.

Vernacular architecture constantly changes. Environment and affordability are the most influential factors, while people who are under rapid developing circumstances prioritize economic benefits and mainstream culture when starting construction. Villagers’ concern on space requirements and building technique are also changing (Ronald 2000). The transition of social relationship is reflected on vernacular architecture. However, domestic research continues to treat Bingzhongluo vernacular architecture as a standstill from the past, with loose generalizations on ancient minority life history (Wang, Chen 1993, Jiang 1997, Wu, Shan 2013, Shan, Wu 2012). Interactions with the modern world are inevitable although daily living and production in Bingzhongluo are only slightly influenced by the growing economy. Dynamic changing processes of vernacular architecture are led by the changing society. These changing processes should be studied systematically that “… beyond mere observation and compilation is critical collation, a nuanced consideration of many variables within an interdisciplinary and comparative framework” (Ronald 2000, p.4).

Policy is another powerful method of changing rural living conditions. The New Countryside Construction policies implemented in 2005 emphasized urban-rural integration as the fundamental solution to rural issues in China (Ye 2014). Modernization development
has become the most important consensus as a series of top-down strategies for governance. Government of the Yunnan Province strives to achieve leapfrog development and reduce the gaps between minority groups and other more advanced regions (People’s Government of Yunnan Province 2011). Bingzhongluo region is currently involved in a massive promotion of rural development. However, most domestic researchers ignore the analysis of the locals’ actual needs from a bottom-up perspective. Supposition from Ronald (2000, p.332) on development of Chinese vernacular architecture is now become true that “for the most part, Chinese seem to be unsentimental about the loss of traditional architecture, viewing demolition — perhaps even the disintegration of traditional culture in general — as the necessary, if unfortunate, accompaniment of modernization”.

Studies have more broadly proved that the modernization development model promoted in poor mountainous regions of Southwest China is unsuitable. Instead, endogenous development model is reasonable and sustainable. “First, this paradigm shifted the development from ‘inward investment’ to ‘endogenous development’. Second, the mode of delivery for rural development has shifted from a ‘top-down approach’ to a ‘bottom-up’ model. Third, the structure of rural development policy has moved from ‘sectorial modernization’ to ‘territorially based integrated rural development’” (Wan, Ng 2014, p.388). These aspects would significantly affect the vernacular architecture. However, further studies on policies promotion for sustainable rural reformation and optimization in Southwest China have not gained sufficient attention.

**Practice and analysis**

**Analysis of the Rural Built Environmental Sustainability Assessment System (RBESAS)**

To investigate the dynamic changing processes in Bingzhongluo, RBESAS is used as a qualitative assessment tool for evaluating the extent of built environmental development in the entire village groups there. This system is an endogenous development-oriented assessment tool that considers both environmental protection and development needs based on human being in the rural regions of Southwest China (Wan 2013).

Villages in Bingzhongluo can be categorized into three types based on the major driving factors of development concluded from overall field investigations. The first type is spontaneous-development village, which is at the primary development level. It has poor communications, so it is slightly influenced by external factors. This type of villages has a traditional lifestyle, and mostly relies on local resources. The next two types evolved from the first one and exhibit different stages of development. The second type is the village influenced by multiple external factors such as particularly intensive policies, enhanced transportation, growing economy, rising tourism, and aggressive external culture. The third
type is strongly influenced by a single external factor — powerful policy, such as the New Countryside Construction. This type of villages can usually be found in newly built areas that are designated as governmental demonstration projects. The old villages where people used to live are often abandoned. These three types of villages’ development phases simultaneously exist in Bingzhongluo. The RBESAS analysis entirely focuses on them.

The framework on issues and indicators of RBESAS is shown in Fig.1.

![Fig. 1. Framework of RBESAS issues and indicators (Wan 2013).](image)

Given that the scoring and weighting system of RBESAS has not been established (Wan 2013), the ideal states reaching the highest standard of each indicator in RBESAS are set as the benchmarks for this assessment. Meanwhile, the worst states are set as the opposite to integrate the development progress. Next, actual development in villages can be assessed under each sub-issue with three criteria: positive tendency, showing condition towards the
ideal state; negative tendency, on the contrary, indicating situation towards worst state; and
not applicable, pointing out that there is no intervention or practice on this aspect by now.
Development degree in each tendency can be described with mild, moderate or severe. The
average development level of each village type in Bingzhongluo is qualitatively evaluated to
present a general comparative analysis on developing gaps between current and ideal state
within each sub-issue, as well as the amount of effort that is required respectively (Fig.2).

![Fig. 2. RBESAS analysis on three village types in Bingzhongluo.](image)

The spontaneous-development village groups are relatively closer to the ideal standard of
RBESAS. The modernization development model implemented in Types 2 and 3 has
induced diminution on village capacities of self-reliance and development, primarily in the
environmental and social dimensions. The most urgent issues in the Bingzhongluo region
are waste management, pollution control, energy self-reliance, and education. A thorough
analysis is performed in two directions, namely, amplitude and distribution.

**Type 1:** The violent swings proved that the spontaneous-development type of village
exhibits very poor development integrity and high vulnerability. Changes in the local
environment and resources extensively interfere with residential life. The positive tendencies
in this type of village group are more than the negative ones. Given that RBESAS is based
on endogenous development, the results indicate that this type of village demonstrates
highly benign conditions in promoting the endogenous development as a model with high
applicability and low resistance.
**Type 2:** Given the market-oriented economy, development is more coherent but also extensive in the village type influenced by multiple external factors. Energy and resources cannot be used efficiently and sustainably while pollution and waste will soon become serious problems due to the intensified development. For this type of village group, most of the positive tendencies are at a mild level. On the other hand, although the number of negative tendencies is relatively small, a part of them is at a moderate level. Therefore, the systematic integration of the development will be holistically improved if the endogenous development model could be conducted in these areas.

**Type 3:** The resistance of vulnerability has a small bump in the village type that strongly influenced by single external factor. Nevertheless, the living level seems to evolve into another type of poor condition. Most negative tendencies are very similar to Type 1, which means problems most in need have not been solved, or been improved mildly. Besides, a majority of positive tendencies are close to Type 2, proving that policy-oriented approach has no obvious advantage compared with market-oriented development. Furthermore, the important positive tendencies in the past such as pollution-free construction, water quality and public engagement, have now been weakened. This phenomenon is a general result of the highly intensive modernization in local villages. That is to say, the policy-guided modernization model is indeed inappropriate for this area.

**Intensive study**

Further study continues in Chugang, Gongka, Gagantang, and Qingnatong village groups in Qiunatong because they represent the typical Type 1 village in Bingzhongluo. Another vital factor conductive to endogenous development in this area is that, “…the collective labor provides channels through which people of different villages and religious groups collaborate and cooperate peacefully” (Wu 2013, p.66). Questionnaires on villagers' attitudes and demands on conventional buildings and public facilities have been distributed to more than 60% of the villagers living in this area.

Researchers and government officials often consider the antiquated and rough dwellings as the largest obstacle to poverty alleviation. However, the judgment on traditional dwellings should be based on local circumstances. The results of the questionnaires indicate that local people are more concerned about environmental hygiene and family income (Fig.3). Most of the physical performances of log-construction houses are accepted and even appreciated by local people. Therefore, an effective method is to perform sustainable renovation work on these houses using advanced but low-cost techniques, instead of opting to demolish or abandon the old houses. The renovation techniques should also be easy for villagers to learn, practice, and inherit.
Public facilities in the study site are ill equipped (Fig.4). More amicable public spaces are necessary. Basic education and sanitation facilities are also urgent requirements for current and future generations. User-oriented design at community scale demands building strategies that takes into account close-to-people hardware facilities. Software enhancements can be well engaged with well-considered community construction, leading a more vigorous village life.

**Conclusion**

Chinese traditional rural architecture provides meaning to the dynamic relationship between people and environment while resonates other aspects of society such as valuable folk tradition, as well as sociocultural elements that link up individuals, family, and society (Ronald 1986). The dynamic changing processes of vernacular architecture should be investigated comprehensively and systematically. Determining sustainable means for vernacular architecture renewal is highly significant under rapid social development.

The mainstream guiding theory and methodology should be introspected. The endogenous development model is more reliable than the modernization model in rural Southwest China. The RBESAS framework in this region is a sustainable and applicable assessment tool for evaluating the development of rural built environment. The RBESAS can
be a powerful research approach although a concrete application method to RBESAS has not been set. Research on regional-scale vernacular architecture should show respect to and support local residents. The bottom-up mode can spur more practical and beneficial research outputs and prompt governmental interventions.

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Vernacular Form of the Boka Kotorska: 
Memory, tradition and inherent resilient thinking

Alan Derbyshire

ABSTRACT This study examines the potential to establish a more resilient model of urban development in the Boka Kotorska region of Montenegro against a backdrop of dynamic adjustment to economic models, urban form and the cultural identity of local communities. The research is ongoing and as such this paper should be regarded as a snap shot of the progress made so far in bringing in to being a more practical model for ecological urbanism.

Many European post communist regions are attempting to re-invent the urban landscape from economically un-viable industrial sites to ‘prestige’ developments, but at what cost? Developers are quick to market the vernacular as benchmarks of tradition and therefore more sustainable, however the resilience of such schemes is questionable. The resulting outcomes conform to ascribed sustainable criteria, but offer few signs of resilient thinking and innovation. Analyzing regions in transformation within former Yugoslavia and reasoning that ecology and culture are two sides of the same coin, this paper considers the reshaping of urban form and the effect on cultural identity. Through case studies the author highlights the role of postmodern vernacular developments and their impact in homogenizing formerly distinctive environments. This is contrasted with the potential for the actuality of cultural traditions in cultivating and embedding resistant measures to climate change.

KEYWORDS: Modernism, vernacular, culture, identity, Montenegro, architecture.

Introduction

The role of vernacular concepts as drivers of bona fide sustainable urban development can be viewed as an antidote to the homogenizing influence of globalization as they contribute towards distinctive regional identities. A vernacular approach to urban form it is contended (Hough, 1995; Heath, 2007; Buchanan, 2006;) is a more viable marker of sustainable development than ‘one size fits all’ current practice in developing regions such as Montenegro, formerly a republic within the Socialist Federal Republic of Yugoslavia.

Given the relatively small population of Montenegro of just 630,000 the complex ethnic make up of its society is a fundamental factor in the future cultural identity of the Boka region. As the ‘newest’ independent state in Europe Montenegro is in the process of making critical choices in establishing an inclusive society for its citizens (Figure 1). This is an enormous task for actors at a national and civic scale and has obvious implications for the development of urban form. In order to facilitate workable and sustainable planning process’s that informs and educates the general population in conjunction with being
accountable to them is a prerequisite to establishing resilient communities. Harmonizing the intricate and juxtaposing philosophies, tensions and historical factors is at the heart of the issue, whether this can be achieved is a tricky proposition, but ultimately makes the area such a rich subject for examination. Establishing the notion of identity within the Boka region is an integral element in the process of determining a formal vernacular narrative for any potential urban form. In other words, what is the collective identity of the region given these complexities and the associated impact on creating a distinctive regional character?

Fig. 1. Regional Map.

There can be no doubt that the spatial characteristics of Montenegro are in keeping with the general understanding of what an unspoiled wilderness may look like. Though there are questionable developments occurring within urban communities, the surrounding uncultivated regions do for most part reflect the untamed images portrayed in promotional literature. The richness of the geomorphological features of the region is a primary reason for increasing levels of tourism. The Boka Kotorska bay is a group of smaller bays connected by channels and is “one of the best indented parts of the Adriatic coast” (Magas, 2002). The bay is surrounded by a karst formed mountainous perimeter, the highest peak being Orjen, which occupies parts of Montenegro and Bosnia and Herzegovina. Due to its ruggedness and relative isolation this region has traditionally been under valued and inhabited. Conversely, owing to the sheltered conditions and deep indentation of the Boka Bay, the coastal region was originally developed as military and seafaring settlements and when situated near to farming areas stimulated urban clusters (Figure 2.). Consequently, the most urbanized region of Montenegro is the Boka Kotorska (Magas, 2002).
Society and Community

Currently there is no majority of peoples within Montenegro, the collective ethnic make up is 43% Montenegrin, 32% Serbian, 7% Bosniaks, 6% Albanians, 5% Muslims and 1% Croats (Monstat, 2011). Though there have been historical squabbles between Serbs and Montenegrins they are connected by a shared language, culture, history and religion (Eastern Orthodox). (Pavlovic, 2003)

In 2007 Montenegro voted for independence from Serbia and immediately embarked on the process of E.U. accession. The goal of further cementing ever growing closer relations with the E.U. and the United States of America remains high on the political agenda. The importance of creating a functioning civil society is a central theme of European accession procedures. The European commission consistently outlines the importance of Civil Society Organisation’s (CSO’s) in documentation pertaining to accession stipulations. Accordingly, the standard of CSO’s are principal facets of the social, cultural and environmental evolution of Europe’s newest state’s case for membership.

The development of the civil society remains an aspirational objective and is an underlying necessity of future E.U. accession requirements. To facilitate the harmonization process of E.U. standards CSO’s are feature in the process of establishing and enhancing accountability and expertise in creating constructive channels of communication with the public. Currently however there is a significant lack of trust towards state institutions and confidence is still in decline. According to public opinion polls conducted in 2011, trust in political parties was 35%, although conversely trust in NGO’s was at 46% (Drakic, Kajganovic, 2012).

The Montenegrin historic cultural identity has to a large degree been moulded by the factional, but conversely tightly knit construct of the tribal society. Paradoxically, the potential for the development of ecological communities is both favourable and problematic. On one hand the family oriented societal structure is a primary constituent of contemporary community life. The social well being of such networks provide a solid foundation for
communities in periods of transition, although the conceptual values of what ‘community’ amounts to are clearly open to discussion. On the other hand, the disparate assembly of ethnic and political factions embedded within Montenegrin society is a variable in the heritage of the notional ‘noble warrior’ associated with its warring history. Additionally, the standardizing influence brought about by the demands of E.U. accession procedures is another significant determining ingredient in the amalgamated compound of cultural identity.

Social groupings are a core aspect of what we generally understand to be community. The collective participation at places of work, neighbourhoods and clubs are what Etzioni describes as “the webs that bind individuals, who would otherwise be on their own”, contribute to the maintenance of “civic social and moral order” (Etzioni, 1993).

Community is to many, the activity of sharing with and participation of commonly held goals that inspire a sense of shared stewardship of neighbourhoods. As such, it’s important to know ones neighbour, interacting with them, feeling safe, and experience at least a sense of support through communal networks. This phenomenon is what Hiss has described as ‘connectedness’, in other words, the adhesive that binds the disparate elements of any community together (Hiss, 1990). In attempting to qualify the notional values of what constitutes a community, it becomes clear that it is almost impossible to communicate the subjective understanding of what that means to the individual. What we do know is when an environment is community deficient the results are plain to see. These are the places of apathy, the areas within urban settings that are void of a sense of understanding of the natural world. As Beatly and Manning observe, “we have experienced the general dulling of the senses that occurs when we feel disconnected from the landscape and our fellow citizens” (Beatley, Manning, 1997).

**Architecture and Planning**

Yugoslav modernism demonstrates many examples of custom made architecture and though not typical of the spirit of modernization it is quite representative of a communal approach to the modernist motif. In actuality the failure of the construction industry to industrialise itself led to the inception of what would prove to be the Yugoslav architectural brand, that being its non-uniformity (Jovanovic, et al, 2011).

This non-uniformity characterized the Yugoslav architectural cultural model. It was not a product of centralized planning, more of a legacy of its constituent regions. The first three architecture schools were established in Belgrade in 1897, Zagreb in 1919, and Ljubijana 1920, followed by Sarajevo 1949, Skopje 1949 and Pristina at the beginning of the 1980’s. The Montenegro University’s Faculty of Architecture was not established until 2002.

Although there were distinctive architectural cultures within the regional schools, they were all united by the socialist modernization agenda, Architects for most part worked within
their own republics under the auspices of the professional organisations, which were organized in accordance with the requirements of the individual republics. Relationships between the regional bodies ebbed and flowed, but consistently united behind the modernization programme. There was also a degree of parochialism in most of the republics, but this for most part was transcended by shared projects, competitions and exhibitions at the federal level (Mrduljas, et al, 2013). As a result of an inadequately trained workforce, limited funding and poor technical systems, architects, companies and workers needed to react quickly to changing conditions and in many cases finish the job the ‘old efficient way’, for example laying bricks or building custom moulds to enable craftsmen to make the structure ‘more beautiful’ (Figure 3.).

The period from the 1960’s to the late 1980’s was characterized by an intensive drive in the preparation of plans for a diverse spatial range of projects on a macro, meso and micro scale from provinces to neighbourhoods to individual sites. This period of progressive and coherent planning objectives underpinned with multidisciplinary and cultivated ideas did not extend into the 1990’s, the post communist period. This phase of development could be characterized as an age of stagnation and economic decline. Politics “took precedence over the attempts of planning practitioners to continue to guide urban development processes” (Nedovic-Budic, Cavric, 2006).

Fig. 3. Museum of Contemporary Arts, Belgrade.

As a consequence of the collapse of Yugoslavia its constituent regions began the process of establishing a more defined regional spatial identities. The accession of Croatia, Slovenia and potentially Montenegro to the E.U. and the implications of the Schengen agreement have effectually reinforced the frontier between East and West. Many of the achievements
associated with Yugoslav utopian modernist form are being forgotten if not ditched altogether in favour of re-traditionalism of the build environment (Mrduljas, et al, 2013).

In recent years stakeholders and actors are once more initiating the cultural and economic connections that were suspended after the collapse of Yugoslavia. To a degree, there is a process of detoxification of the regions shared socialist past and new real estate actors are influencing the development of the built environment. Partly in response to the deregulation of planning procedures and comparatively benign political normalization, there has been significant foreign investment and a corresponding housing boom prior to the recent financial crisis.

Against this backdrop it is argued that the “lessons of previous uncompleted modernism seem superior to the current situation” in terms of concepts and urban development, but also regarding the politics of public space which are becoming less and less about the public good. (Mrduljas, et al, 2013).

The Foreigner Factor

The influence of foreigners over matters such as infrastructure, the economy, political and cultural traditions and subsequent dilution of indigenous conventions and practices is a source of local anxiety. Russian investment in the economy of Montenegro is at a higher level than in other former socialist countries and is a source of much rumour and anecdotal narratives particularly regarding buying land and real estate in the coastal region.

To put this into context, not long before the global economic crisis Montenegro had received “more foreign investment per capita than any other country” in Europe. In a large part this was due to Russian investment in the form of wealthy investors buying up extensive parcels of land on the Montenegrin coast. As such, the coast is now viewed as a fashionable alternative to coastal Turkey and the South of France. This occurrence is not confined to beachside leisure investments; the Russian oligarch Oleg Deripaska has made significant investments in the Montenegrin industrial sector (Biliefsky, 2008)

This coastal ‘appropriation’ is arguably best observed in the town of Budva. Situated south of Boka bay the larger Budva region is colloquially known as the Budva Riviera. Further afield however, the resort is debatably best known for the amount of Russian tourists and property owners inhabiting the area. To many, the town is now referred to and in some cases better known as ‘Moscow by the sea’. There is much suspicion and conjecture regarding the origins of the money streaming into greater Budva; accordingly the Russian mafia owns every nightclub in the town if local gossip is to be believed. However, some of Russia’s senior politicians, judiciary and leading luminaries such as president of the Diamond Chamber of Russia, own expensive land and real estate to the raised eyebrows of some (Anin, 2011).
It is clear that tourism has significantly influenced the urban form of the Boka Kotorska. The most significant ‘sustainable’ development within Boka Bay is Porto Montenegro, an ex-military facility transformed into a super yacht marina with residential and commercial facilities. Nautical tourism is recognised as a favoured type of tourism and the increasing demand created by this kind of tourism given the natural beauty of the coastline, is viewed as economically sustainable and environmentally desirable as the function of a marina is deemed to be less harmful than its previous function (Spatial Plan of Montenegro, 2008).

The layout of the marina village is meant to replicate the style of a typical Montenegrin village “combining the sophistication of a super yacht destination with the picturesque vernacular of Montenegrin architecture” (Adam Consultancy, 2010). To others however the village “atmosphere is Miami-meets-Venice with a healthy dollop of Soviet chic: models in thongs, men with spray tans, and four-story apartment buildings” (Bloomberg, 2011).

Porto Montenegro’s claims of sustainability are very much founded in the architectural connection between local vernacular traditions and cultural identity, though this claim is moot. The vernacular of Porto Montenegro is more in keeping with Aldo Rossi’s notion of the ‘analogous city’ (Rossi, 1984) and as such here the vernacular should be appraised in terms of a broad-brush adoption of local vernacular traditions (Figure 4.).

Fig. 4. Montenegro vernacular house & Porto Montenegro village.

Resilience and Sustainability

The branding of Montenegro as ‘The Wild Beauty’ has now become a memorable strap line and established connecting theme to the broader ecological objectives of the state.
However, once the veneer of public relations and media publicity is peeled away the perception of the reality of the ecological state is less impressive. Recent developments regarding the construction of four dams on the Moraca River (originally abandoned due to international displeasure and lack of investment) call into question the depth of commitment to the principle of ecological development. Accordingly, the revised scheme is dismissed as an outdated marriage of “outdated technologies and unrealistic forecasts”. The World Wide Fund for Nature (WWF) and its Montenegro associate Green Home dismisses Montenegro’s Energy Development Strategy to 2030 as “window dressing” for the discredited but now revisited Moraca Dam project (WWF, 2014). Such examples of political and economic environmental expediency is at variance with the spirit of the ecological state, undermining the expressed level of commitment by the government and further fuelling the skepticism of the Montenegrin people.

The expansion of urbanity in the region is clearly a matter that should be managed in a sustainable manner. How this is achieved in accordance with the actuality of the fundamentals of ecological and therefore resilient objectives is a primary concern. Urban communities can be viewed as elemental ecosystems within broader and global ecosystems. As such they provide economic opportunities for their inhabitants within local and also international spheres of reference, but conversely are also conducive to environmental disturbance. How human influenced ecosystems interact with connecting diverse ecosystems is a significant issue at a regional level, but more relevantly at a biospheric scale.

Models of Progress

Acknowledging that urban communities are ecosystems that function in collaboration with others is a fundamental feature of resilient thinking. For decades in post war Yugoslavia and by extension urban Montenegro, modernist developments were the structures in which communities were established and evolved. By and large Yugoslavs bought into the socialism of the state and supported the utopian ideals and architectural representations of it. Within the context of the Boka Kotorska how the region develops and maintains a realistic model of culturally and environmental identity in the wake of cultural ‘disruption’ and urban expansion is the crux of the matter. The overriding objective of environmental policy should be to understand that ecosystems and the communities and elements that form them are not to be controlled, but rather intertwined with and responded to as a symbiotic activity. Defining and therefore administering models of sustainable development is problematic in part as a result of the many interpretations of sustainable development - estimated at over one hundred (Moffatt, 2001). Identifying an effective model for the spatial appraisal of future
developments that negotiates the philosophical, social and scientific elements of resilient thinking should be a primary objective.

Moffatt supports "Bossel’s orientors concept" as a more progressive model of analysis. Accordingly, Bossel’s work highlights the importance of ecosystems to urban development and the potential for developing cities into thriving ecosystems. Newman and Jennings (2008) draw on the theme of orientors (indicators) as a structure for urban development to highlight the model of the City as part of the patchwork of ecosystems that are constituents of wider bioregions.

The development of sustainable indicators is by no means uncommon. There is a broad spectrum of indicators in use over a diverse range of regions and cities (Brandon, Lombardi, 2005). Nevertheless, there is disagreement relating to the efficacy of such indicators stemming from the lack of consensus on the fundamentals of urban sustainability depending on the understanding of various stakeholders (Derbyshire, 2012). Additionally, the range of indicators selected has been criticized as inadequate for supporting and measuring urbanization proceedings (Seabrooke et al., 2004). However, the indicators established here are intended to offer practical markers of ecosystem good practice.

The urban forms of an ecosystem are arguably more likely to knit together with the communities that they coexist with if they reflect the identity of their inhabitants. The notion that vernacular forms are more likely to resonate with local residents and therefore help to establish a distinctive identity is persuasive. However, in the case of Porto Montenegro the connection with Montenegrin vernacular traditions is not clear and this is reflected in other tourist driven developments within the region. Similarly, the Russian development of the neighbouring Budva region has obvious implications for culture, communities and urban form that reflect the ‘Montenegrin’ identity.

Establishing a set of principles in keeping with the spirit of Bossel’s orientors that contribute to the complex cultural resilience of the region and also stem the divergence between urban form and regional landscape is a principal objective of this research project. As such, it is proposed that a pragmatic assessment framework tool be initiated to identify benchmarks of resilient and sustainable practice based on vernacular principles that reflect the spirit of Bossel’s orientor theory. Broadly, Bossel proposes, “any earthbound environmental and socio economic system can be characterised by six fundamental environmental properties” (Moffatt, 2001). These are:

- Normal Environmental State: The actual environmental state can vary around this state in a certain range.
Scarce Resources: The information energy, and material resources required for a system's survival are not immediately available when and where needed.

Variety: Many qualitatively very different processes and patterns of environmental variables occur and appear in the environment constantly or intermittently.

Variability: The normal environmental state fluctuates in random ways, and the fluctuations may occasionally take the environment far from the normal state.

Change: In the course of time, the normal environmental state may gradually or abruptly change to a permanently different normal environmental state.

Other Systems: The behavior of other systems introduces changes into the environment of a given system. (Bossel, 1998)

As a framework for the indication of healthy eco-systems the Bossel system provides a broad based foundation for development. As such it is useful as a stimulus for a more pragmatic model of sustainable assessment, but more importantly within the context of the Boka Kotorska, a more accessible marker of cultural resilience. Accordingly, it is proposed that a framework of five categories is more relevant to transitional communities and wider regions. These are:

- Vernacular: Assessment of local trades and crafts, tradition, identity, 'heimat'.
- Energy: Renewable, local initiatives, off grid etc.
- Systems: Water flows, waste, carrying capacities, flexibility
- Place: Materials, ecology, ownership, connectivity, motif
- Culture: Economic, political, landscape, art/science

The framework can be applied at various scales, from domestic habitats to large tourism projects and is intended to act as an informal assessment tool (Figure 5). For example, the rating for culture could take into account factors such as potential for entrepreneurship, local traditions and connectedness to complimentary networks. The overall rating would require all five categories to be assessed and graded in order to provide a resilience rating for the subject of scrutiny. The final visual matrix would identify areas of strengths and areas that require more work. When observed for individual developments the matrix will serve as a benchmark or learning process for future projects. Viewed over a broader scope of assessed projects within a specific region they will give a visual reference of the potential for cultural and ecological resilience.

Case Study – Assessment

As a method of illustrating how the visual matrix model could look it is proposed that the appraisal of an existing ecologically empathetic tourist development be assessed. Accordingly, The Eco-Camp site is situated on the North coast near the border with Croatia.
and was established within 8,000 square metres of rural land in 2010. The camp was created by two foreign European émigrés to Montenegro. The land was completely off grid with no supplied water, no electric and no sewerage system in place. The issue of providing a water supply was central to the development of the site given the obvious needs of tourists to shower and use toilet facilities etc. and also to supply an organic kitchen garden. The owners opted for the installation of compost toilets a simple but effective technology.

To source a water supply the owners use a small petrol engine pump, to pump water from the spring adjacent to their land and fill a 45,000-litre water tank at the beginning of the season. This is currently the only source of water and it is estimated that they have extracted 150,000 litres of water from the spring in the last three years. The only source of electricity is from a small PV panel though the amount of power produced is negligible. It’s enough to run 4 x 3 watt 12v DC fans 24 hours a day and keep a battery fully charged all summer. The fans are a vital component in the compost toilet and waterless urinal installations. As there is spare power in the battery, they hope to run an LED lighting system off it too this year. For the past 3 years they have relied on their 2.5kW generator to provide power needs in the evening. They run it for 3-4 hours every evening to provide light, charge phones & laptops etc. With increased use of solar lights and additional DC lighting system running off the battery they aim to reduce the use of the generator over time.

![Fig. 5. Vernacular Eco System Index.](image)

Put simply, the case study as illustrated by the chart, scores highly in ‘Systems’ due to efficient water collections and grey water irrigation systems as well as compost toilets and
other composting methods. The “Vernacular’ indicator does not score comparatively well due to little evidence of local traditions, conventional building methods being used (re-enforced concrete) and no references to local vernacular form. Energy conservation is good, but is still being improved. Creating more interaction with local networks and including local materials and resources in future building projects can improve both culture and the place elements.

Conclusion

The Boka Kotorska region is in a state of flux. The resulting outcomes of dynamic change in the social and spatial characteristics of its communities are at this point unclear. On one hand it could be argued that the influx of foreign investment during a period of global financial uncertainty has mitigated economic hardship in a region heavily reliant on tourism. On the other hand it can be reasoned that the spatial and cultural identity of its urban personality have been compromised by generic interpretations of vernacular traditions. However, what is clear is that sustainable communities are built on strong cultural identities and sense of place, not on the requirements of the elite whose fashioning of homogenised versions of imported vernacular form undermines authentic alternatives.

Montenegro has a rich heritage and culture, but planning policy appears to be pulled in all directions by policy makers box ticking measures that accord with E.U. accession demands and the developer’s predictable minimum cost maximum profit mentality. This short termism can be viewed in other Mediterranean tourist destinations, but the Montenegrin government strives for something different.

The cultural resilience of Boka Kotorska is a viable prospect. A more holistic approach to urbanism that embraces the vernacular in its broadest of manifestations from the memories of post war modernism to traditional coastal stone houses is advisable. Both are elements of Montenegrin spatial identity and are equally as formative in the cultural and civic identity of its constituent communities. Establishing a visual model of cultural resilience is both sustainable and ecologically beneficial in assessing and comparing benchmarks with future developments. Montenegro still has the potential to realise its ecological ambitions, but must adopt a more flexible approach to change, which should be in keeping with the memories and lessons learned from its recent history.
References


Dialogue 3

Building Local Resilience: Can it be planned for?
ABSTRACT Scholarship on urban resilience initially focused on the environmental impacts of climate change, but today has expanded to take in the multi-dimensionality of urban life, including infrastructure, emergency response systems, healthcare, rule of law, and the making of communities. This interest in communities has stemmed from the idea that social capital is one of the key elements that strengthen a society’s ability to manage shocks. Thus, it is often assumed that social capital enables societies to react quickly and rationally to hazards, avoid descending into chaos, reorganise in creative ways, adapt, and improve. This begs the questions, what happens when injustices are prevalent in society? Does this weaken a city’s resilience? And is there a deeper and more complex relationship between injustice and resilience?

Many scholars have argued that resilient cities are more just cities. This view stems from the idea that hazards - and also food, water and energy insecurity - tend to affect the urban poor more than the wealthy, making certain social groups and areas more prone to experience environmental injustices than others. But could it be the case that a city’s resilience-enhancing measures have embedded within them pre-existing injustices? What if the process of increasing the resilience of the city as a whole happens at the expense of the rights of certain groups? If urban resilience focuses on the degree to which cities are able to reorganise in creative ways and adapt to shocks, do pervasive inequalities in access to environmental services have an effect on this ability?

Zooming into the resilience-seeking practices of ordinary women and men in the periphery of Lima, Peru, I intend to explore the above questions and ultimately to call for a repoliticisation of resilience, where not only scale but also justice matters.
Fantasy Economics and Resilience

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ABSTRACT We need resilient communities in a world dominated by divisive economic doctrine, and dancing on the edge of several planetary boundaries while stepping decisively over others. How can we create places in which we can not only survive, but thrive? Sheffield has seen its fair share of visionaries and utopians, so I asked myself what kind of city I would ideally like to live in. This is a game of fantasy economics.

When we think about a truly sustainable, resilient urban economy – it is not just about the use of classic economic instruments – taxes and incentives – it is about the architecture of our whole livelihoods – food, transport, energy, our homes and work places and how they interact. The kind of place I would like to live would have: a transport policy that reduces cars to being mere guests on our roads, to allow living streets, the economy of foot & pedal to flourish. A City-wide currency that captures and multiplies the value of all the exchanges that occur in the economy, and makes it harder for wealth to be sucked out to inflate hedge fund and remote shareholder pockets. There would be banks that are there to be economically and socially useful for the communities they locate in, and the city should be able to mobilise its own capital. Local people are directly involved in key decisions about how resources are allocated and in deciding priorities for the place where they live.

Urban centres would be more than the just playthings for multinational retail brands to clone and from which they extract our money. There is comprehensive urban greening through both productive and aesthetic gardening and farming, this reconnects communities with the food chain and improves the urban appearance and environmental quality. There is, of course, a radical carbon reduction plan.

For overall conviviality – I want an environment that encourages open, public spiritedness, not one that promotes self-interested acquisitiveness so there are checks and balances on the excessive visual pollution of advertising. There will be housing that brings us together as communities, makes us feel good and makes it easier to live low-impact lives. And, we will do away with plastic bags.

This is the kind of place that I would like to live in. It is, of course, a complete fantasy, isn't it?
Session 16

Co-Producing Urban Resilience
Co-Producing Urban Resilience
Doina Petrescu & Constantin Petcuou

**ABSTRACT** This paper addresses contemporary processes of resilient co-production within the city. Focusing on the case study of a project called R-Urban, it aims to present a bottom-up framework for urban regeneration initiated by atelier d'architecture autogérée (aaa). It addresses questions raised in implementing the R-Urban strategy in the Parisian suburb of Colombes, advocating new roles for architects and planners. This strategy explores possibilities for co-producing urban resilience by introducing resident-run facilities that form local ecological cycles and engage in everyday eco-civic practices that will eventually conduct to the emergence of networks of urban commons. The paper demonstrates that progressive practices of collaboration and new tools adapted to our times of economic crisis are conceivable on a small, local scale and can gradually scale up to wider co-produced strategies of resilience.

**KEYWORDS:** Co-production, co-produced urban regeneration, right to resilience, micro-social and cultural resilience, commons, commoning.

**The co-produced city**

Co-production has become a buzzword in our times of austerity: it posits the necessity to engage citizens personally in the provision of public services no longer provided by the welfare state. If co-production is currently seen as an economic and social solution to this problem,¹ we also understand it as a shift in the power relationships revolving around services and production. In urban transformation, co-production can also become a political project rooted in Lefebvre’s idea of the social production of space (Lefebvre, 1991). Citizens have the right to occupy space and decide how it is developed, managed and used. Also, given the imperative to adapt and find solutions to the long-term environmental and economic crises societies face today, cities and citizens need to become more resilient in order to adjust and thrive in rapidly changing circumstances. This ambitious co-production project should involve the entire urban population and needs ideas, tools, space, time and agents. Can architects be such agents? What tools can be used at times of crisis and scarcity? How can progressive practices be initiated while acting on a small scale? How can civic cultures of collaboration be reactivated and sustained in economic, environmental and social terms?

**R-Urban, an agency of co-produced urban regeneration**

These are some of the questions we tackled with R-Urban. New co-produced resilient
approaches to urban regeneration are desperately needed. R-Urban is an open-source strategy enabling residents to play an active part in changing the city while also changing their ways of living in it.

This strategy creates a network of citizen projects and grassroots organisations around a series of self-managed collective hubs hosting economic and cultural activities and everyday practices that contribute to boosting resilience. The network starts at a neighbourhood level, by setting up a local network and progressively scaling up to city and regional level.

R-Urban involves residents, local authorities, public organisations, professionals and civic stakeholders taking various responsibilities in the project’s governance. In contrast to other regeneration projects, architects and planners become initiators, facilitators, mediators and consultants. This leads to more effective, faster and more sustainable implementation, allowing for greater participation of non-specialists in co-producing it. The projects are conceived as processes that result in a physical transformation of urban contexts, and the emancipation of those living in them.

R-Urban is part of a tradition of modelling resilient development starting with Howard’s Garden City (Howard, 1889) and Geddes’s Regional City (Geddes, 1915), and continuing today with the Transition Town (Hopkins, 2008). But in contrast to these models, R-Urban is not a direct application of theory, but tries to develop exploratory practice and theoretical analysis, each constantly informing the other.

As opposed to the Garden City concept, R-Urban does not propose an ideal, but deals with the collapse of modern urban ideals, and failures in addressing the future. Also, R-Urban picks up from the Regional City concept the idea of regional dynamics, but in this case using bottom-up initiatives of local residents. The R-Urban transformation is realised by investing in temporarily available spaces and creating short-term uses able to prefigure future urban developments.

R-Urban also incorporates many Transition Town principles, although it negotiates its own ‘town’ (e.g. a block, neighbourhood or district). No pre-existing communities are targeted; instead, new communities formed through the project agree on their own rules and principles. With its civic hubs and collective facilities, R-Urban tries to lend visibility to the networks of solidarity and ecological cycles it creates. Architecture plays an important role here: that of hosting and showcasing resilient practices and processes, and of rendering tangible and concrete what would otherwise remain a discourse. Positioning ourselves (and the project) theoretically between political ecology and Marxist and Post-Marxist sociology and politics, we took inspirations from social theorists and philosophers like Guattari, Gorz, Lefebvre, Harvey, Negri and Holloway that we have constantly challenged by the reality of our active research approach.
R-urban in Colombes

In 2011, R-Urban started in Colombes, a suburban town with 84,000 residents near Paris, in partnership with local authorities, organisations and residents.

Colombes offers a typical suburban mix of private and council housing estates. Suburbia is a key territory for R-Urban: although specific to a modern conception of city, it is one of the most crucial territories to be regenerated in the interest of resilience. Colombes is confronted with economic deprivation and youth crime, typical of large-scale dormitory suburbs and the consumerist, car-dependent lifestyle in more affluent suburbs with generally middle-class populations. Colombes nonetheless also has a number of assets: despite a high unemployment rate (17% of the working population, well above the national average of 10.2% in 2012), Colombes features approximately 450 local organisations and an active civic life.

We have contacted the local municipality in 2009 and a number of local organisations with the R-Urban strategy and applied together for a Life+ partnership to be funded by the EC.

In its initial four-year period, the project was meant to create a network around a number of ‘collective hubs’, each serving complementary functions (i.e. housing, urban agriculture, recycling, eco-construction, local culture), that bring together emerging citizens’ projects. With welfare services being withdrawn, these collective facilities host citizen-run services that play a strategic part in locally closed economic and ecological cycles.2

In order to identify appropriate locations within available plots in the city, a participative mapping process has been initiated which conducted to the shortlisting of three locations for the construction of the three first hubs: Agrocité, Recyclab and Ecohab.

Agrocité is an agricultural unit comprising an experimental micro-farm, community gardens, educational and cultural spaces, plus experimental devices for compost-powered heating, rainwater collection, solar energy generation, aquaponic gardening and phyto-remediation.

Agrocite has been built in 2012-2013 on a plot situated in the core of a social housing estate the Fosses Jean neighbourhood, with a local eco-construction company and using local materials (reused windows and cladding elements issued from eco-construction, recycled brick drying panels, straw for insulation from local farmers). Currently, Agrocité runs as a hybrid structure, with some components of social enterprise (e.g. the micro-farm, market and cafe) and others connected to the user organisations (e.g. the community garden, cultural and educational spaces) and local associations.

Recyclab is a recycling and eco-construction social enterprise unit comprising facilities for storing and reusing locally salvaged materials, recycling and transforming them into eco-
construction elements for self-building and retrofitting. It has been installed on an existing road that was closed and transformed into parking. The spatial condition of this location has challenged the architecture of the recyclab which was designed to be dismantled quickly in case of energy within the public servicing systems of the road (sewage, electricity, etc). The unit itself is made out of reused containers on the top of which we have placed a number of prefabricated wooden huts, realized also with reused wooden cladding, whose geometry has been carefully informed by the shape of the street tree canopies. Recyclab host co-working workshops for makers and designers and a participative workshop open to residents for repairing and small DiY sessions.\(^3\)

Ecohab was planned to be a cooperative eco-housing project comprising partially self-built and collectively managed ecological properties, including shared facilities and schemes (e.g. food cultivation, production spaces, energy and water harvesting, car sharing). The seven properties included two subsidised flats and a temporary residential unit for students and researchers. Due to the change of municipality in 2014 the construction of Ecohab has been temporarily postponed.

R-Urban’s collective facilities are indented to grow in number and be managed by a cooperative land trust that will acquire spaces, facilitate development and guarantee democratic governance.\(^4\) Networks and cycles of production and consumption will emerge as the basis for a circular and ecological economy connecting the R-Urban collective facilities and the neighbourhood, and closing chains of demand and supply as locally as possible. The strategy which has clear and simple principles, can be as such propagated regionally and even at bigger scales. A number of municipalities have shown interest to develop such projects in Ile de France region (ie. Bagneux, Gennevilliers). Also, the art and architecture practice ‘public works’, who is our partner in the R-Urban project in London, is currently developing a connected project in Hackney Wick: R-Urban Wick.\(^5\) Its first facility is a mobile production and recycling unit: Wick on Wheels (WOW), which encourages residents and local artisans to produce, reuse and repurpose.

R-Urban sets a precedent for a participative retrofitting of metropolitan suburbs where the relationship between the urban and rural is reconsidered. It endeavours to demonstrate what citizens can achieve if they change their work routines and lifestyles to collectively address the challenges of the future.

The ‘right to resilience’

‘Resilience’ is a key term in the context of the current economic crisis and lack of resources. In contrast to sustainability, which is focused on maintaining the status quo of a system without necessarily addressing the factors of change and disequilibrium, resilience addresses how systems can adapt and thrive in changing circumstances. Resilience is a
dynamic concept with no stable definition or identity outside the circumstances producing it. It is adaptive and transformative, inducing change that harbours potentials for rethinking assumptions and building new systems (Maguire and Cartwright, 2008). Although the current resilience discourse is not to be embraced uncritically without paying heed to the sometimes idealistic comparison of social and biological systems and their adaptability to engendering wellbeing, the concept of ‘resilience’ itself has the potential to include questions and contradictions addressed in terms of political ecology.6

R-Urban creates the conditions for citizens’ ‘right to sustainability’ to be exercised, to both consume sustainability (provided by the remains of the welfare state or bought from private providers), and to produce it (allowing citizens’ involvement in decision-making and action).

A politico-ecological approach like that of R-Urban will not just positively propose ‘improved’ development dynamics, but also question the processes that bring about social injustice and inequitable urban environments. We take here a Marxist line with David Harvey (2008) who argues that the transformation of urban spaces is a collective rather than an individual right, because collective power is necessary to reshape urban processes. Harvey describes ‘the right to the city’: ‘it is a right to change ourselves by changing the city’ (Harvey, 2008: 23). In this sense, R-Urban facilitates the assertion of this ‘right’ through appropriation, transformation and networking processes, and the use of urban infrastructures. However, R-Urban perhaps differs from Harvey in scope, as it does not seek to institute a large-scale global movement opposing directly the financial capital that controls urban development, but instead aims to empower residents to propose alternative local projects, and to foster networks, testing methods of self-management, self-building and self-production. In this respect, R-Urban is perhaps closer to a more locally embedded idea of ‘the right to the city’, as proposed by Lefebvre. Lefebvre imagines a locally conceived emancipatory project, emphasising the need to freely propose alternative possibilities for urban practice in everyday life. He proposes a new methodology, ‘transduction’, to encourage the creation of ‘experimental utopias’. Framed by existing reality, this would introduce ‘rigour in invention and knowledge in utopia’ as a way of avoiding ‘irresponsible idealism’ (Lefebvre, 1996: 129-130). Lefebvre underlines the key role of urban imaginaries in understanding, challenging and transforming urbanity and opening the way to a multiplicity of representations and interventions. From this perspective, R-Urban is a ‘transductive’ project, both rigorous and utopian, popular and experimental. It is based on the aggregation of many individual and collective interventions which complement each other, forming metabolic networks that stimulate circulatory changes while simultaneously informing one another. Such networks will accommodate multiplicity and valorise imagination at all levels.

R-Urban could hence be suspected of aligning itself opportunistically with the ‘Big
Society’ principles recently proposed by the UK’s Tory prime minister, David Cameron, to implement ‘the idea of communities taking more control, of more volunteerism, more charitable giving, of social enterprises taking on a bigger role, of people establishing public services themselves’ (Cameron, 2011). But the essential difference is that R-Urban is not responding directly to the onset of the financial crisis and is not embracing a programme of economic resilience in which the state is absent: such a programme would explicitly promote reliance on unpaid work to mask the disappearance of welfare structures and the massive cuts in public services. R-Urban questions the state’s power in terms of its role and responsibility. Local authorities and public institutions are integrated in the strategy as equal partners, assuming the roles of enablers, sponsors and administrators. In addition to urban residents and civic organisations, public institutions are invited to take part in this experimental utopia, and to challenge their routines. It is not only the residents who must ‘change themselves by changing the city’, as claimed by Harvey (2008), but also the politicians and specialists presently in charge of a city.

As such, R-Urban is not only about grassroots innovation to meet social, economic and environmental needs, but also about political critique and ideological expression, affirming the necessity of new social and economic agencies based on alternatives to the dominant regime. R-Urban puts new democratic tools in place: forms of self-governance supporting the emergence of different kinds of economic organisation. These are all part of a cooperative civic land-trust, which will democratically govern the entire R-Urban project.

Unlike other initiatives exclusively dealing with resilience from a technological and environmental perspective, R-Urban advocates a general change in how we do things, in order to change our future. R-Urban proposes new collective practices, which, in addition to reducing the ecological footprint, also contribute to reinventing near-at-hand relationships based on deciding collectively, sharing spaces and grouping facilities, rules and principles of cohabitation. The transformation needs to take place on the micro-scale of each individual, each subjectivity, to build a culture of resilience. As Rob Hopkins puts it, ‘resilience is not just an outer process: it is also an inner one, of becoming more flexible, robust and skilled’ (Hopkins, 2009: 15). The ‘culture of resilience’ includes processes of re-skilling, skill sharing, social networking and mutual learning. These micro-social and micro-cultural practices, usually related to individual activities (e.g. food cultivation and waste collection, car-sharing, exchanging tools and skills with neighbours), elicit attention to the innovatory potentials found in everyday life. R-Urban maps this local capacity to transform in detail, but also the administrative constraints that block it, proposing ways of bypassing them by way of restated policies and structures.
Commons and commoning

The issue of commons lies at the heart of discussions revolving around co-produced democracy. Michael Hardt and Antonio Negri (2004) define commons as something that is not discovered but produced biopolitically:

We call the currently dominant model ‘biopolitical production’ to underline the fact that it involves not only material production in straight economic terms, but also affects and contributes to producing all other aspects of social life, i.e. the economic, cultural and political. This biopolitical production and the greater number of commons it creates support the possibility of democracy today. (Hardt and Negri, 2004: 9-10, author’s translation)

A sustainable democracy should be based on a long-term policy of commons as well as the social solidarities understood as such. ‘Creating value today is about networking subjectivities and capturing, diverting and appropriating what they do with the commons they give rise to’ (Ravel and Negri, 2008: 7, author’s translation). According to Ravel and Negri (2008), the revolutionary project of our time is all about this capturing, diverting, reclaiming of commons as a constitutive process. This is a reappropriation and reinvention at one and the same time. The undertaking needs new categories and institutions, new forms of management and governance, spaces and actors.

R-Urban endeavours to co-produce this new infrastructure. The facilities and uses proposed by R-Urban are shared and propagated on various scales, progressively constituting a network that is open to various users and includes adaptable elements and processes based on open-source information.

Rather than buying it, the R-Urban land trust currently established in Colombes bypasses the fixation on notions of property and negotiates land for (short and long term) uses rather than ownership. The ‘right to use’ is an intrinsic quality of commons, as opposed to the right to own. As in previous projects, a specific focus here is on urban interstices and spaces that evade financial speculation, if only temporarily. This is also the position of Holloway (2006) who concludes that ‘the only possible way to think about radical change in society is within its interstices’ and that ‘the best way of operating in interstices is to organise them’ (Holloway, 2006: 19-20, author’s translation). This is exactly what R-Urban does: it organises a range of spatial, temporal and human interstices and transforms them into shared facilities, it sets up a different type of urban space, neither public nor private, to host reinvented collective practices and collaborative organisations, it initiates networks of interstices to reinvent commons in metropolitan contexts. This type of organisation involves forms of commoning, ways of ensuring the expansion and sustainability of the shared pool of resources, but also ways of commonality as a social practice.
R-Urban's future

In the coming years, we will nurture diverse economies and initiate progressive practices in R-Urban's network in Colombes. However at the moment with the change of municipal political orientation from left to right, we have to renegotiate the municipal support for the project and also the future location of hubs. We have designed R-Urban to be a process that can grow with time, being easy to appropriate and replicate. We will be testing it for a while, before leaving it to burgeon by itself. Will it succeed? For how long? These questions are to be answered in a few years’ time. For now, it is a visionary attempt to realise more democratic processes of resilient suburban regeneration, to potentially be followed up by others in similar contexts.

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References


Notes

1 Co-production is receiving ever-greater attention in policy-makers’ speeches and think tank reports. They are aware that ‘co-production has emerged as a critique of the way that professionals and users have been artificially divided, sometimes by technology, sometimes by professional and managerial practice, and sometimes by a spurious understanding of efficiency. It provides an alternative way for people to share in the design and delivery of services, and contribute their own wisdom and experience, in ways that can broaden and strengthen services and make them more effective’ (Boyle and Harris, 2009).

2 For more information, see http://r-urban.net.

3 This concept is similar to the ‘Fab lab’, short for ‘fabrication laboratory’, a small-scale workshop equipped with
various fabrication machines and tools enabling users to produce ‘almost anything’ (Fab lab, n.d.).

4 For more information about the R-Urban cooperative land trust, go to http://r-urban.net/en/property.

5 This collaboration is supported by the Life+ programme in a partnership between aaa, the City of Colombes and public works.

6 We are here joining the ranks of political ecologists who criticise the superficial understandings of politics, power and social construction popularised in resilience rhetoric (see, e.g., Hornborg, 2009: 237-265).
Suffocating Cities: Obstacles to urban self-organisation

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ABSTRACT This paper discusses the need for research at the interfaces of alternative architectural practice and legal, regulatory and procedural frameworks of the construction industry in order to improve the reach and influence of alternative approaches. Investigation into design participation and alternative practices in architecture has developed methodologies to democratise the design process by better engaging user groups and investigating potentials for self-organisation in the production of the built environment. No longer do architects merely impose their own vision of form on inert urban matter. Architects have begun to understand the built environment as a complex ecosystem which has grown up without a blueprint; where the role of architectural design is to facilitate a form of urban growth that is driven from within. The scarcity of development land and the time and cost associated with regulatory approval has placed the ability to build or adapt well beyond the reach of many citizens. However, initiatives such as Self Build, Live Projects and other bottom-up building practices develop strategies and methodologies that build local resilience. As yet, the reach and influence of these new forms of urban development has been limited. Can these methodologies be made to fit within a dominant system of development driven by neoliberal economic policies favouring short-term economic gain? With the emergence of the community asset as a new form of ownership, development may begin to realign its priorities in favour of longer term social gain. Is there evidence that our complex regulatory systems are suffocating the underlying forces of self-organisation that shape our towns and cities? What are the obstacles that must be overcome in order to make new forms of urban development possible? Is there a case for change in regulatory control in order to stimulate sustainable urban renewal and build local resilience? Through a review of case studies in urban self-organisation, the paper will identify how access to sources of capital, productive labour and governmental power are limiting citizens’ ability to influence the built environment and reducing our capacity to self-govern.

KEYWORDS: Alternative practice; design participation; new community institutions; new forms of governance; urban self-organisation.

Introduction

“The principle difficulty is the time it takes to persuade institutions, local authorities and funders to support proposals” (RUSS, 2014, p.14). This quotation sums up the motivation for this paper: to discuss the obstacles which stand in the way of a new approach to urban development termed ‘self-organisation’. The key characteristic of self-organisation is that it emanates from its subject, meaning that the key stakeholders are internal users who
constitute elements of a pre-existing community or urban ecology\(^1\). Another characteristic of the approach is the willingness to cultivate new forms of urban development which do not follow pre-existing models.

Since the 1960’s urbanists have argued that the effects of external intervention in complex urban systems are unpredictable: ineffective at best; destructive at worst. This explains a gradual movement towards systems in which urban development comes ‘from within’. But, a logic which understands cities as naturally self-organising systems, free from external control, ignores the politicised nature of these systems and the control which governmental and capital interests exert over them.

This paper is interested in the new roles for architects working within alternative practice as agents, advocates or facilitators of self-organisation. I will argue that legislative and economic control stifles self-organisation by creating obstacles which reduce the capacity of the urban system to govern itself, suffocating the organic growth of our towns and cities. I will go on to argue that architects – amongst others – can play a role in overcoming these obstacles, facilitating new forms of bottom-up urban growth\(^2\).

**Alternative practice**

The term ‘alternative practice’ has been used to describe a broad field of architecture and urbanism concerned with the transformative potential of spatial praxis\(^3\) as a form of participatory democracy. These ‘alternative’ practitioners are interested in the role architects or urban planners might play in bringing about social or political change.

The project Spatial Agency\(^4\) describes how self-organisation in architectural practice is radical in nature because “it does not simply suggest participation in something that is controlled elsewhere…” (Awan, Schneider and Till, 2011) as is often the case where public consultation is forced upon a project through governmental regulation,“…but actively establishes the desire and need for a transformation in the first instance, before acting on it” (ibid). As a project of micro-political tactics\(^5\), self-organisation seeks to enable citizens to transform their environments using mechanisms that are embedded within their own locality. To achieve this, alternative practices have designed processes which facilitate a collective production of space\(^5\).

As yet, these practices only exist at the periphery of the architectural profession and the vast majority of actors involved in the construction industry do not recognise their practice as a social or political one. Rather, the mainstream view understands construction as an industry and development as a commercial activity; the built environment is simply the product of these technological and economic sciences. This dominant system of
development operates with its own logic and according to its own set of values, primarily motivated by a desire to accumulate private wealth.

Alternative practices allow community groups to self-organise by enabling them to be their own developers. Through temporary use projects or through shared ownership of community assets, there are growing opportunities for people to take control of their own environment and envision development that does not have to follow conventional frameworks.

Self-organisation in urban systems

Jane Jacobs (1961) argued that the kind of deductive reasoning adopted by modernist planning was incapable of supporting the complex, layered characteristics of communities. She observed how the zoning of cities had separated out land uses which previously overlapped both spatially and temporally. These urban systems had grown up organically over time in response to a complex and changing set of conditions. They supported vibrant and diverse communities where more intense social interactions were created by increased density and a mix of different uses at different times of the day.

Juval Portugali describes the three main features of self-organisation: “first that they are open systems, i.e. that they are dependent on their environment, second that their behaviour can be creative or inventive in response to their environment and third that they are complex both in terms of the number of parts and the non-linearity of cause and effect” (Portugali, 1999, p.51). Prigogine and Stenger’s dissipatively self-organising systems describe dynamic orderings that maintain themselves through continuous exchange with their environments (Bujis, Bol, Teisman & Byrne 2009, p.99). Similarly, Cilliers is interested in the “property of complex systems which enables them to develop or change internal structure spontaneously and adaptively in order to cope with, or manipulate, their environment.” (1998, p.90)

Portugali states that “a central question is how to plan and design cities in light of their nature as bottom-up self-organising systems” (2013, p.4). The mere recognition that urban systems display self-organising characteristics cannot address the problem of the exteriority of the urban strategist. The claim that “the planning and design of artefacts are direct manifestations of humans’ chronesthetic memory”, and that “humans are, in this respect, natural planners and designers” (Portugali, 2013, p.3), is used to suggest that we can all enjoy equal influence over the built environment. This fails to recognise that professional planners and designers are paid for by dominant governmental or venture capitalist power structures. Despite this, Portugali’s observation about chronesthetic memory - that is, our
ability to use past experiences to anticipate future events - seems particularly pertinent. This ‘natural’ ability to think about the future with reference to the past could be understood as the key ingredient of self-organisation in establishing a desire or need for transformation, regardless of the particular formative context. We must stop asking how we can plan for self-organisation and ask how we can provide the tools to enable it.

The legal, regulatory & procedural framework of the construction industry

In order to influence the built environment, self-organising groups (like any other urban developers) need access to certain resources, namely economic capital, productive labour and governmental power. Disjunctions between capitalist and self-organised urban reproduction are revealed at the interface with legal and regulatory frameworks, which place constraints on how these resources can be accessed.

With the steady rise in privatised procurement of public services and infrastructure in the UK, ever more complex legal and regulatory frameworks and procedures have emerged in an attempt to guide the free-market to serve public interests. A new service industry has developed in which specialist lawyers, accountants, contractors and technical designers are consulted to navigate this regulatory landscape. This creates a formative context which biases the outcome of the negotiations between developer, consultant and regulatory authority. These roles co-determine one another, such that their dependency on one another begins to define their structure and their values. The values of professionals tend to align with those of the developer and the content of regulation becomes focused on yield and profit. Through their co-dependency these legal and regulatory frameworks, which exist ostensibly to constrain the dominant system, also serve to protect it from transformational alternatives.

There is a need to develop and implement alternative models for these frameworks which will enable self-organising processes. The following sections discuss a number of different ways in which urban self-organisation is being restricted by frameworks which control access to the resources listed above.

Access to governmental power

“The Government has set out plans in the Localism Bill to revolutionise the planning process by ‘taking power away from officials and putting it into the hands of those who know most about their neighbourhood – local people themselves’. Alongside this, the government aims to create the freedom and the incentives for those places that want to grow to do so, and to reap the benefits.” (TCPA, 2011, p.1)
This is a bold claim for any of the established UK political parties to make and it is not clear if this revolution would serve a right-wing or left-wing agenda. At the time of writing, we are approaching the next general election, so we are yet to see what kind of powers, if any, are to be handed over, and to whom they are to be handed. Many people will be pessimistic that there is any real motivation within the mainstream political parties for changes which will bring about a fairer and more sustainable society. Rather, these policies appear to fit with a neoliberal agenda which is moving towards ever greater reliance on, and de-regulation of, the private sector, founded on a belief in free-market economic policies as a universal remedy.

There are clear instances of this government policy failing. Just this year, a petition to save a row of shops and businesses from demolition in Sheffield demonstrated enormous public resistance to a mediocre re-development scheme. In response to the proposition that local people were not being represented by their councillors, several local councillors claimed to be powerless to stop the development. Councillors Rory Munn and Bob Johnson both agreed that “if there were any opportunity for us to refuse this application we would have done” (Three Docuteers, 2015). Councillor Ibrar Hussain added: “everybody wanted to save this site but the problem was planning laws” (ibid.). In this case, councillors had the power to refuse the application, but had been advised that if they did so, it could be overruled at appeal stage and that this would cost the council £67,000 in legal fees. Clearly, the balance of power here was set between an elected council, the recommendations of senior officials within the local authority planning department, and the planning inspectorate. Despite the overwhelming public support to preserve a valuable existing community space, their elected local representatives were unable to exercise their powers to overrule the recommendations of planning officers.

Let us suspend our disbelief and assume that the above policy statement expresses an intention within the government to redistribute power in society in order to improve citizens’ ability to participate in and exercise influence over the development of our built environment, and that the government will offer the freedom and incentive to do so. How then, might this power be transferred? Community Land Trusts are a useful example.

Community land trusts (CLTs) were established in UK law by the Housing and Regeneration Act 2008 for the express purpose of furthering the social, economic and environmental interests of a local community by acquiring and managing land and other assets. Amongst other suggested benefits, rental tenures could be better protected and local communities could effectively share in the profits of the development, which might otherwise go into the hands of a ‘developer’. Another key facet of CLTs is that open membership has
the ability to regulate who can buy or rent the properties and how much is charged. This has created a new form of ownership - distinct from private and public ownership - which has the potential to radically change the way land is developed and managed.

Based in the London Borough of Lewisham, one such group, the Rural Urban Synthesis Society (RUSS), have obtained a grant from the Homes & Communities Agency to help realise their plans. Although they have been able to advance their proposals in some detail thanks to input from experts in the field, they are encountering excessive delay and incurring additional cost as a consequence of regulatory procedures imposed by the local authority.

The legal department of Lewisham Council have insisted that the project be put out to competitive tender through an OJEU process. Given that there is no known competition for the site, this would appear to be an unnecessary and excessive administrative procedure. According to the CLTs’ legal advisors, there is no requirement by law to run an OJEU process in this case. It is possible that the local authority feel they need to show that the sale of the land has been carried out in a fair and open manner. However, in so doing they risk alienating the membership of the CLT and draining its limited resources. There is a sense that this is a scheme that has a great deal of support in the local area, and yet it is failing to receive the support it needs from the legal and regulatory framework, which governs it.

Access to sources of capital

Thus far, the most visible way in which the Localism Bill is being implemented is through a series of financial incentives for local authorities, developers and individuals to increase housing supply, but critics have already identified a number of fundamental flaws in these schemes. The £500m ‘Get Britain Building’ scheme provided recoverable finance to support the completion of private sector developments that had stalled following the financial crisis of 2008. This project is to continue with a new fund of £525m rebadged the ‘Builders Finance Fund’. This propping-up of the private sector by the state highlights the fragility of a housing policy which relies so heavily on the private sector to meet housing demand.

The ‘Help-to-Buy’ and recently announced ‘Starter Homes’ & ‘Help-to-Buy ISA’ schemes improve access to finance and offer discounts to first time buyers. However these schemes can only be of benefit to a narrow section of society who fit within the eligibility criteria. Those in the greatest housing need still have very little opportunity to access public capital in a way which allows them to exercise choice. The uncontrolled rental market tends to create a second class of citizens who do not enjoy the freedom and security that home-ownership brings, resulting in the break-up of local communities as members are pushed out by rising prices.
In Lewisham, Community Land Trust RUSS’s self-build development is founded on the principle that it will provide a mix of tenures at permanently affordable levels\textsuperscript{12}, by setting rents and sale prices themselves and with 30% savings - achieved through the ‘sweat-equity’ of self-builders and the sharing of the residual profits of the trust.

Despite the availability of grant funding from central government, this development – which will provide 100% affordable housing - feels that it is better off sourcing capital from elsewhere\textsuperscript{13}. The current regulations set by the Homes & Communities Agency (or by the Greater London Authority in London) are likely to have been developed around the existing private sector model for the supply of affordable housing and may not be appropriate for CLTs. RUSS member Kareem Dayes points to a lack of UK-based lenders set up to finance community building projects. RUSS needs agreement from Lewisham council on the sale price of the land before they can secure funding, but they cannot secure funding without agreement from the council on the land value.

**Access to sources of productive labour & technical expertise**

“It is our experience that self-build can start to go wrong when the self-builders feel alienated and not in control of the design and building process. It would be tragic to fall into the same trap that organisations fell into in the 1990’s by wishing to control the process too closely rather than providing a level of support that enabled self-builders to get on with it.” (RUSS, 2014, p.14)

That public money should pass directly through disadvantaged communities and back into large multi-disciplinary consultancies and contracting companies is a concern for any project which employs self-organisation as a tactic. Bottom-up, community driven projects can become victims of their own success. Acquiring the funding and approvals necessary to get on site requires an increasing investment in their consultant team. Public sector agencies exert control by setting requirements over the labour/technical services which a project must employ to realise their objective. For instance, Heritage Lottery Fund projects insist on the use of consultants who fulfil pre-qualification criteria which may seriously limit the options of the client group to select a consultant team. The criteria tend to favour larger consultancies who are often structured around the dominant system of private sector driven development. This creates a formative context which can pre-determine the processes and outcomes of the design process, imposing normative solutions upon the project rather than finding solutions that are embedded within the locality or that respond to the actual social constitution and dynamics of the community.
This trend is described by Walter Menteth (2015) as ‘Hidden Architecture’ where architectural services are introduced to public sector projects as a second- or third-tier subcontractor to larger developers or contractors\textsuperscript{14}. This is understood to “reduce open competition, access and choice for the public” (Menteth et al., 2015, p.2). It further reduces the ability of architects to act in the interests of the community because they draw their income through the developer or contractor.

Although they have been developed primarily as an educational tool, university-based ‘Live Projects’\textsuperscript{15} can be seen as a way of redressing the restricted access of some communities to the productive labour and practical and imaginative tools that are necessary to influence their environment. When Live Projects are successful they can promote a democratic and self-organising approach to the reproduction of space whilst strengthening the communities with which they collaborate. Students are not paid for their services but instead reap the rewards of a rich educational experience. Live Projects can also catalyse the establishment of resilient communities which endure long after the end of the short project. Because they are normally student-led projects which focus on collaboration and participation, their approach is often unencumbered by deterministic procedures of professional practice, and they often generate highly responsive and innovate outcomes.

Similarly, urban practitioners and community art projects are often able to operate independently of institutions and governance structures. Groups like City Mine(d) operate around projects which may not be focused around architecture, design or construction but which are primarily focused on the reappropriation of public space. These organisations tend to act as a facilitator who adopts or is adopted by a community to develop or embody a collective imagination to find solutions to urban problems. At the intersection of art and politics, artists, alternative architects and other urban agents are paid - if at all - either by arts funding organisations, local authorities or community organisations.

The method of reward for these services is often downplayed, but it can go a long way to explaining the nature of the relationship between the ‘facilitating urban agent’ and the community itself. Authorities may view experts or agents within the community with suspicion because of the power associated with those experts' knowledge bases, and their autonomy from sources of funding and regulation. With increased importance being placed on community-led design\textsuperscript{16}, community project management services are becoming a growing area of specialism within the wider marketplace for construction industry services. However, if this growth is driven by government regulation (and paid for by private developers) it is likely that such community involvement will amount to little more than an illusion of participation in a process which is actually being controlled elsewhere.
Conclusion

This paper has identified four different types of obstacles to urban self-organisation.

*Ineffective democratic systems*

As the demolition at Division Street shows, elected representatives do not have the power they need to represent the interests of their constituencies. We need to find ways to invigorate current processes to allow democratic imagination and vision to flourish.

*Restrictive procedures*

Existing economic risk management and blind and uncritical conformity with procedure obstructs new forms of development directly and indirectly. Procedures enforced by funding bodies restrict access to productive labour and professional expertise which may render community projects impotent when they become subsumed within a regulatory system which does not share the same values or objectives.

*Inadequate legal & regulatory frameworks*

The procedures and controls that are necessary to protect the public from private sector development do not appear to be appropriate for groups founded on principles of community interest, such as community land trusts. Current frameworks have not yet adjusted to these new forms of development, and are creating obstacles to their success.

*Release of control by governance structures*

There is a need for governance to recognise that self-organisation cannot be pre-planned and must be understood as a bottom-up phenomenon. There is a need to promote a widespread understanding of the benefits of self-organisation and to find ways to relinquish control without jeopardising the ability of the state to limit abuses of the built environment by capital interests.

The examples discussed here were selected because they cross boundaries between three spheres of influence. First, the construction industry: constituted by its investors, developers, contractors and consultants. Secondly, the state: constituted by elected central and local governments, their unelected advisors, civil servants, NGOs and QUANGOs. Thirdly, the public: constituted by a diverse and interdependent citizenship or urban political ecology.

Architectural methodologies which support bottom-up design processes will continue to be restricted unless they engage with each of these broader spheres of influence. It is
possible to conceptualise them as ‘disciplines’ which tend to operate with a degree of separation from each other. As a broad church situated across the arts, humanities and sciences, architectural practice has a unique perspective on the ideas surrounding urban self-organisation and has the potential to work across the boundaries of these disciplines. There is a need for further research into the challenges faced by self-organising communities and their alternative practitioners to find ways of making these new modes of urban reproduction more influential and inclusive.

By understanding self-organisation as a means of combatting the homogenising forces of capitalism, it is possible to consider alternative practice as a tool for exploiting and widening cracks in the dominant system of development. In contrast to this ‘anti-capitalist’ perspective, supporters of a strong but neutral state can observe how local communities are being encouraged to occupy sunny plots fertilised by supportive public policies. This polemic attempts to underline the politicised nature of space as a financial commodity, where organic growth is only permitted within precisely defined limits. We need to accept the visionary nature of the task before us: of supporting urban self-organisation and contributing to a credible long-term trajectory of transformation.

References

Notes

1 Urban self-organisation becomes quickly politicised when we consider the actual constitution of any given community - how they define their boundaries and the way in which their membership is controlled, either actively or passively. Community is understood here as an element within an inter-dependent urban political ecology where local issues become regional, national and global ones.

2 The term ‘growth’ is problematic and it is clear that many urban centres in Europe have begun to shrink in physical size, or in population, so that their challenge is not one of growth but decline, and how urban areas can be resilient to changes which bring about different types of growth and shrinkage. In this text, growth is synonymous with transformation in the reproduction of the many constituent parts of the ‘built’ or ‘urban’ environment, which, following Lefebvre (1970), is understood as a dynamic field of social relations and social production.

3 Spatial Praxis: Following the work of Hannah Arendt in her 1958 work *The Human Condition*, where praxis is an everyday political action, “spatial praxis” is used here to signify a form of democratic and participatory action which re-appropriates public space.

4 Spatial Agency is an Arts & Humanities Council funded research project that has assembled an expandable database of architectural projects which demonstrate a transformational intent and is critical of conservative approaches to architecture (Awan, Schneider and Till, 2011).

5 Micro-political tactics: Following Michel De Certeau in *The Practice of Everyday Life*, (1988), tactics are distinguished from strategy in that they are employed from a position of subjugation within a dominant system.

6 The project Spatial Praxis attempts to assemble for the first time, a database of organisations, projects and events which present new approaches to architectural/spatial practices which do not fit with the traditional roles of the architect as either academic or professional.

7 Following Roberto Unger in “False Necessity”: to the three resources of capital, labour and governmental power, could be added “practical and imaginative tools” or the power to imagine or envision the future. Although beyond the scope of this paper, this can be seen as another important resource for self-organising groups, which is frequently embraced in alternative practice where events, actions or projects catalyse a collective imagination.

8 Public interests such as environmental and social sustainability, affordability and space standards in the housing sector and various minimum requirements for public facilities and services

9 Formative contexts which bias the outcomes of the everyday social negotiations and conflicts we undergo in determining our social future (Unger, 1987: 33)

10 Specialist planning lawyers may also be consulted in these situations to advise on the likely outcome at appeal. Contrast this with the powers granted to the Mayor of London who is able to overturn planning decisions with scant regard for planning policy. In practice, these decisions have been made in favour of big-business and against the local planning authorities recommendations: for an example refer to Fruit & Wool Exchange, Spitalfields: http://www.bbc.co.uk/news/uk-england-london-19896394. [accessed 12 April 2015].

11 Information based on a meeting with Kareem Dayes held on 3 April 2015. Kareem has been a founding member of Self Build group RUSS since the group formed in 2010.

12 The government definition of a Community Land Trust is “a non-profit, community-based organisation that develops housing, workspaces, community facilities or other assets which remain in the public sector and which are made available at permanently affordable levels and which is controlled by the residents, local people and the council.”
In the RUSS’s Church Grove project, the mechanisms for controlling sale and rental levels and the mix of the residents are driven by the need for the community to adapt to change in the long term and ensure that all residents have a stake in how the CLT is managed. In RUSS’s report, they state that “the GLA Affordable Housing Grant will not be applied for, to allow the group to set rent levels that are affordable for each member of the community.” (RUSS, 2014, p.14) Because of the strings attached to grant funding available through the HCA, RUSS have decided to pursue a self-financing approach by obtaining a mortgage that will be serviced by rental income.

As Walter Menteth states in relation to public procurement in the years 2008 - 2014, “48% of opportunities are now in ‘hidden architecture’ where the facilitator, developer or contractor is asked to provide the design services. Of the sample extracted the hidden market provides some of the most notable in scale, value and range. These can only be accessed by architects as tier 2 or tier 3 sub-contractors if at all. This has reduced open competition, access and choice for the public.” (Menteth et al, 2015).

A summary of the governments policies on community led design: “The government is creating opportunities for communities to shape the design of their areas. New neighbourhood planning rules are helping to achieve this, as is the Localism Act 2011 requirement that developers involve communities at the pre-application stage of large schemes. To complement this, the National Planning Policy Framework encourages councils to favour schemes that have been designed in collaboration with communities.” https://www.gov.uk/government/policies/increasing-the-number-of-available-homes/supporting-pages/community-led-design.

Primarily concerned with construction as a commercial activity which makes profit.

Primarily concerned with policy, law, procedure and regulation.

A social body whose concerns are plural but who all share in, or lay claim to urban space. Following Heynen, Kaika & Swyngedouw (2006), this sphere of influence is understood as an Urban Political Ecology, which recognises the social, environmental and economic interdependency of a local and global ‘public’.

To expand on this analogy, the dominant system of urban reproduction could be likened to a field that has been concreted over, where organic growth is restricted by an absence of light, air and water. The surface above is purified and abstracted, clean, uninterrupted and disconnected from its context; ready for imposition from above. Governmental initiatives like CLTs are very small, very neat, precisely defined planting beds cut into this monolithic slab, where organic growth is encouraged by financial incentives, but where the seeds and the fertiliser are imported from elsewhere. Alternative practices may locate cracks in this concrete structure and over time work to break through it. Their task is much harder and at greater risk of failure, being consistently uprooted by the diligent gardener-oppressor. The organic growth that rises from below will naturally attempt to occupy the abundant fertility of the planting bed, but may suffer the same fate because it is not the right kind of growth.

In the late 1980s Roberto Unger wrote of how social theorists had thus far failed to provide any credible long-term trajectory of transformation, resulting in a “bastardised and paralysing conception of political realism: a conception that dismisses far-reaching reconstructive ideas as utopian fantasies and immediate, partial reconstructions as reformist tinkering” (Unger, 1984: 39).
ABSTRACT In 1997 the NZ$15 million Christchurch Convention Centre (designed by Warren and Mahoney Architects) was opened. In March 2012, it was demolished. The building was one of over a thousand buildings in the Christchurch Central Business District that were damaged during the earthquake sequence that affected the city between September 2010 and late 2011. This paper will examine the design and construction of the new Christchurch Convention Centre in contrast with The Commons, a temporary community project located adjacent to the former convention centre's location. The new Convention Centre Precinct, also designed by Warren and Mahoney with Woods Bagot Architects (between its Adelaide, Sydney and Melbourne offices) is expected to cost over NZ$500 million. The developments in Christchurch provides an opportunity to contrast the development of public projects with different levels of engagement by its citizens.

The current machinations of the two projects are viewed with respect to emerging discussions in architecture and urban theory that refer to the “civic economy”, which identifies a transition in the delivery of civic infrastructure beyond traditional models of market, state or community. By comparing these two projects, this paper will analyse the transitional period of Christchurch towards recovery, as an opportunity to move from top-down delivery to participatory and incremental models in order that architecture and urbanism can strengthen its civic purpose. The emergence of temporary (or transitional) projects in post-quake Christchurch help to articulate an emergent set of practices that anticipate changes happening to other cities in the twenty-first century.

The essay finishes with a speculative proposition; what would happen if these two modes of urban development – the short-term civic and the permanent economic - were to co-exist in a place, and what might this look like?

KEYWORDS: Master planning; temporary architecture; civic economy; transitional architecture; Christchurch.

It was the second quake

At 12.51 pm on 22 February 2011, a massive earthquake shook the City of Christchurch in New Zealand. It was not the first, but one of over 13,000 that jolted the city and its rural surrounds between September 2010 and the end of 2011. 185 people were killed as a result of the 6.3 MI February quake; ninety percent of houses were damaged. As a result, a national state of emergency was declared, the military was called in, and the central
business district (CBD) was cordoned off from Christchurch’s citizens. They were not to re-enter without official permission for over two years while over seventy percent of CBD building stock was being demolished.

Fig. 1. With good humour, anonymous Christchurch citizens have awarded demolition sites with accolades. Woods, Rueben. 2012. Best Demo [photograph].

In response to the natural disaster, the national government established the Christchurch Earthquake Recovery Agency (CERA) that took over the recovery strategy of the city, including its urban planning. On 30 July 2012 – sixteen months after the February 2012 earthquake - a bold new plan to rebuild the central city was announced by CERA. Dr Ryan Reynolds describes this period of planning that occurred after the earthquake but before reconstruction plans are realised as a kind of post-city and pre-city (Reynolds, 2014). Within
this timeframe, it is not only the government that is re-imagining the city. In parallel, and in contrast, to the multi-billion dollar delivery of civic projects by CERA, citizens have created hundreds of their own temporary projects on a fine-grain scale, such as performance venues and commercial spaces (Freerange Press, 2012). The interim is a transitional period in which politicians, citizens, planners and developers compete in forming the city around their different desires.

The future

Sixteen months after the February 2012 earthquake, the national government of New Zealand, under the auspices of CERA, revealed a visionary blueprint for rebuilding the CBD and its surrounds. The focus of this blueprint is to create eighteen major anchor projects, which includes a convention centre, sports stadium, performing arts centre, and precincts of innovation and health (Canterbury Earthquake Recovery Authority, 2012). Within the past three years since the earthquake, there has only been minor instances of public engagement with these projects.¹

A key project in the recovery plan for the city is the Christchurch Convention Centre. It is significant because of the amount of public funds (NZ$284 million) being dedicated to the project. It is being administered by Christchurch Central Development Unit (CCDU) under CERA, which has promised to bring millions of dollars annually through visitor expenditure. Under this process, the extraordinarily powerful Christchurch Earthquake Recovery Act gives the minister in charge exemptions from any consenting or consultation processes. The brief, the design specifications, and the business case for the convention centre have been not made available to the public despite the public investment and civic language surrounding its conception – as it will “meld city life” and be a “symbol for the city and its people and must reflect the identity of its place” (Woods Bagot, 2015).

The Christchurch Convention Centre also takes a prime position in the CBD being built between the Avon River and Cathedral Square, taking up two important city blocks. Kirsty White, urban designer of “global design and consulting firm” Woods Bagot reflects on the design: “The idea is that typical convention centre functions; the exhibition space and the plenary space are wrapped with local uses and local amenity” (Canterbury Earthquake Recovery Authority, 2014). After three years, there is a lack of public information available to suggest how this will occur. There is a concern with the rhetoric of the proposal and the final outcome. For example, originally “roof top gardens overlooking Cathedral Square for public uses, views of the Southern Alps, a public winter garden” were proposed (Canterbury Earthquake Recovery Authority, 2014). They are no longer visible in the available renders. The convention centre will be complete in 2018 and this lag between planning and
completion is reflective of most anchor projects. By mid-2015, only one of the eighteen projects has been realised from the city blueprint. Some, like the new stadium, are possibly over ten years from completion.2

Fig. 2. Visualisation of the Christchurch Convention Centre from the Avon River. Woods Bagot. 2014. Christchurch Convention Centre [architectural render].

The present

In the time that many anchor projects are under planning and construction, hundreds of provisional projects have emerged throughout the city to contribute to its rebuilding (Freerange Press, 2012). A first wave of temporary projects occurred as a quick response to the lack of water, toilets, and other public amenities and essential services that enable cities to function.2 The next wave of short-term projects to follow, however, was driven by different sets of needs such as the desire to remember the city, engage in its remaking, and to form new ways of interacting with the unfamiliar and broken landscape.

It is productive to view this interim period of Christchurch with its abundance of temporary projects in light of writings in architecture and urbanism discourse around temporary use of vacant properties, which has been thoroughly investigated over the last decade in European and North American cities (cf. Haydn and Temel, 2006; Wainwright, 2010; Stealth.Unlimited, 2010; Colomb, 2012; Bishop and Williams, 2012; Tonkiss, 2013; Oswalt et al., 2013; Ferguson, 2014; Németh and Langhorst, 2014). Within the framework of urban planning, temporary use is the time period between where a property ceases its prior function and is waiting to be redeveloped for its maximal utility and/or profit (Weber, 2002). Urban Catalyst documented temporary-use in Berlin, Germany, over a decade and identified many different types of temporary uses in their publication Urban Catalyst: The Power of Temporary Use, which include: cultural venues, co-working facilities, neighbourhood hubs, artistic
installations and leisure spaces (Oswalt et al., 2013). Temporary-use is recognised (and celebrated) for the opportunity to re-imagine in a “time and space for alternative forms of development and for users from outside the dominant planning and ownership framework” (Stealth Unlimited, 2010).

The increased study of temporary-use in wealthy economies reflects larger structural changes to these locations under the process of neoliberalisation (cf. Brenner and Theodore, 2002; Keil, 2009; Peck and Tickell, 2002; Weber, 2002; Short and Kim, 1999). In parallel to the potential of temporary use that operate outside the demands of property market cycles, under neoliberalisation, temporary-use projects can also have the opposite effect in assisting the calibration of the urban environment towards economic growth. Temporary-use projects can add other sorts of value to a site – by providing site surveillance, maintenance, cultural amenity and manufactured participation - that later gets cashed in for an increased return when the property is flipped or developed. Fran Tonkiss warns that the creative incubator or pop-up can quickly turn into a developer demonstration project or land grab (Tonkiss, 2013). risk producing amiable conditions for long-term development through improving the amenity of an area (Arbus et al., 2014) but without their presence, the presence of the groups that came together to create them or the issues that brought the parties together. The risk is that they become “a victim of their own success” (Tonkiss, 2013). Geographer David Harvey discusses a similar problem when talking about the public investment in large projects and how they “... are allocated to produce something that looks like a common but which promotes gains in private asset values for privileged property owners” (Harvey, 2012). Both transitional and more permanent projects use the rhetoric of the common good, but the common good is not one thing; it is multiple and contested.

Neoliberalisation has undergone continuous critique due to its uneven allocation and distribution of resources towards citizens. Parallel to this critique is an interest in architecture and urban discourse to locate precedents that assist in imagining other ways of social and economic organisation to address this uneven distribution. In the publication Compendium for the Civic Economy architect Indy Johar optimistically marks out a transition or shift with the emergence to a new type of paradigm. His publication refers to this as the “civic economy”, which is “an economy that combines the spirit of entrepreneurship with the aspiration of civic renewal” (00://, 2011). British Prime Minister David Cameron writes in the introduction of the publication, “We’re only going to make life better for everyone in this country if everyone plays their part – if change in our economy and our society is driven from the bottom up” (00://, 2011). While this can be read as austerity-driven rhetoric, one thing is notable in the call for the civic economy is that society is becoming more open and social in
terms of how society collaborates and communicates (00://, 2011) even if these means are sometimes susceptible.

A shift towards the shared enterprise of production has ramifications for the built environment beyond new typologies for architecture to give form (such as sustainability centres or fablabs) to new models of ownership, organisation, resourcing and delivery (Tonkiss, 2014). The purported emergence of a new type of economy and its shared modes of production also requires new forms of institution to guide this process because “many of our public institutions and public organisations were born in the late nineteenth and early twentieth century (Bourgon, 2011). This presupposes that the binary between citizen-led and government- or developer-driven temporary-use may be more blurred or less important than the governance models in place for their creation and management.

The period after the quakes and before the stabilization of the city-form in Christchurch provides an opportunity for new types of organisations, networks and institutions to emerge - such as within the process of creating temporary-use projects - as it may offer particular examples and benefits to shepherd in this “civic economy”, which was recently highlighted by a letter from local and international activists to the Mayor of Christchurch (despite the danger for projects to be used as a form of “austerity urbanism”). They surmised that “The advantage of this approach is its ability to test out and prototype ideas in the physical world; act as an interface with the local neighbourhood; open up the process to the wider community; and experiment with new forms of institution building, exploring how governments, developers and citizens might work together better” (Moore et al., 2014). The awareness of temporary-use and its benefits in testing new modes of operation has seen temporary-use projects emerge in architectural and urban design as a tool for planners, developers and citizens, including in the recent rebuilding of Christchurch, New Zealand.

The common

While an anchor project like the convention centre may take six years to realise, a public space called The Commons appeared on an important city site – opposite the site of the old convention centre – within a few months of the building’s demolition. In late-February 2012 the former building on the site – a hotel – was demolished, and the Christchurch City Council (CCC) cancelled the leaser’s hold to re-establish ownership of the land. The council approached local non-government organisation (NGO) Gap Filler – that has been activating temporary vacant sites since the first quake in September 2011 – to take over the management of the site and its programming. This shared enterprise of community organisation and local government shifts the creation of public space from a top-down model of producer and consumer to one that is collaborative.
In the past three years Gap Filler has facilitated over 100 temporary projects with dozens of community organisations, including different experiments of temporary occupation at The Commons, such as art installations, sports events and performances. In the management of the site, even its guiding principles are provisional. Its website states: “Key stakeholders on this site have developed a set of values and principles by which they wish to be bound in their operation, activation and management of this site” (GapFiller, 2015). Organizations involved with or located onsite include Gap Filler, Life in Vacant Spaces (Livs), Greening the Rubble, Festival of Transitional Architecture and Commons Food Collective, which have all emerged post-earthquake around temporary projects. Some are formalised as umbrella or community trusts; others, like Commons Food Collective, are loose groupings; many receive local government support. These organisations represent a surge in new organisations engaged in the creation of the city, albeit provoked by a disaster, and reflect Johar’s call for a renewed civic spirit of heightened collaboration in the creation of the built environment where the distance between user and producer is reduced. The image below show members of the public, rather than contractors, carefully helping to roll out the new turf that replaced a previous large project. (The Pallet Pavilion.) This illustrates one of the ways in which the roles of space-makers and space-users are mixed in this kind of civic project.
This civic nature is evident in temporary experiments at The Commons. One of these projects was a large temporary pavilion made out of blue shipping pallets, which occupied the site between October 2012 and May 2014. Aptly named the Pallet Pavilion, it provided an important performance space for community groups and artists while venues across Christchurch were being repaired. “The space has been open for a summer and has had over seventy events and approximately 25,000 people pass through it” (Bennett and Halliday, 2013). While the project was created to last for one summer, due to its popularity it lasted two years - led by a public refinancing campaign on crowdfunding website PledgeMe - before the ongoing costs and maintenance (including expensive 24-hour site surveillance in case of fire) required its deconstruction. The project was carefully dismantled and almost all the pallets were returned to circulation and the concrete foundation (itself recycled from a demolitions building) was given to nearby farmers to re-use as bridges. The Pallet Pavilion illustrates Gap Filler’s particular approach to community design: the Pallet Pavilion was the result of active participation and commitment from interested citizens rather than capital investment. An immense amount of volunteer labour drives these projects, with the Pallet Pavilion alone requiring, and attracting, more than 2600 hours of gifted skilled and unskilled labour from 80 volunteers and 40 businesses (Pallet Pavilion, 2015).
The transitional

In architecture and urban theory, temporary-use is the term adopted to describe the temporary projects witnessed in Christchurch. However, locally, these projects are referred to as transitional. The word transitional was first used in the context of temporary postquake activities in the 2011 Christchurch City Council Central City Plan that was drafted after the quakes before being superseded by the larger CERA led plan. The word transitional is preferred over the term temporary as transitional acknowledges that a short-term and small-scaled project is an intermediate step that contributes to the long-term development of the city. This positive model, where the state (or local council) creates conditions favourable for temporary use via legislation or assistance (Tonkiss, 2013), has seen CCC establish a number of programmes such as the Transitional City Project Fund to assist in brokering sites, navigating regulations and providing funding. The local council also directly funds the organisation Life in Vacant Spaces (LIVS) that brokers vacant sites and empty buildings with people looking to create art projects, small businesses and cultural events.
The present and the future

The approach to the realisation of the Christchurch Convention Centre and The Commons appear as polar opposites. The convention centre is a slow, long-term and expensive project planned by the government with the business community that lacks sustained engagement with local residents, but meets the needs of increased visitors to the city and the flow-on effect of increased economic revenue. In juxtaposition, The Commons and its cavalcade of temporary projects are quick, short-term, agile and cheap that address short-term needs of locals, but is not built on a long-term sustainable business plan. Both will be places of assembly for different scales, types and functions of diverse groups – that cover the spectrum from businesswomen to bohemians. But they are two different forms of city-making solving very different types and scales of problems. The Christchurch Convention Centre addresses economic growth as its first priority while temporary (or transitional) projects address the immediate need of providing social spaces, which can create civic meaning and form outside of typical planning and property frameworks. It is tempting to conclude that the two modes might comfortably fit together and support each other, however this may not be the case.

Following the comparison and critique of these two projects and their different time-frames, scales, processes and purposes, a speculative question is raised; what kind of building and activity would result if the two modes were to start engaging with each other?

The advantage of temporary, or transitional, projects is that they can avoid the slowness of large projects and engage immediately with the site and potential users. In the context of Christchurch, transitional projects have re-connected citizens with a broken city by providing spaces for social production – eating, meeting, talking, sleeping, and praying. Imagine if the Christchurch Convention Centre started with a small-scaled transitional project to engage the local community to provide a space to address the immediate concerns of its citizens who lack social spaces. This could inform some of the future spaces to be integrated into the final outcome, which is promised in its desire for “local uses and local amenity.” This sees a transitional project move beyond the notion of a project contributing to the social and physical well-being of a city to its large-scale planning, or even its economy. However, this requires government and business to have a planning vision that allows for more risk and experimentation in the design process. This also entails more political risk as experimentation inevitably introduces the possibility of failure, even if this failure is small and leads to improved outcomes.

New forms of participation or co-governance are also implied if the projects are to overcome the risk that a temporary project could “serve as a thin PR exercise and provide planning alibis for the speculative developments that follow” (Tonkiss, 2014 167) This is embedded in the potential of transitional projects beyond its temporary nature, program,
scale or iterative design approach. The strength of these projects depends upon the close cooperation of citizens with the support and enablement of local government. This is a planning vision by government that is kept in check by its citizens who hold it account by working closely together.

Conclusion

The comparison of the Christchurch Convention Centre and The Commons highlights that there are many different ways to make and inhabit space in a city. In the twentieth-century the discipline of architecture and urban planning has implicitly favoured more stable and permanent forms of building and construction (Bishop and Williams, 2012) that privilege already a powerful political and economic constellations of actors. Temporary-use projects, labelled as transitional projects in Christchurch, demonstrate a way where architecture and urban design can be considered as an iterative process that opens up a flexible approach to building of cities with its citizens. The interim period provides a gap whereby these projects can rethink market-driven notions of time and use, and in doing so provide a moment to re-imagine the city with different coalitions of people and things. Connected to a large-scale project, it also champions an adaptive approach that can improve the lumbering pace of large projects that disconnect the citizens of a city from the delivery of a project many years later. Experimentation and refinement can also mitigate the massive capital risk to the public inherent in large projects.

Temporary and transitional projects have connected diverse people together after the natural disaster towards a city of increased collaboration, communication and co-creation. This reflects Johar’s declaration that there is an emergence of other ways of organising the economy in the production of space. In Christchurch at The Commons, this includes crowdfunding and land stewardship. Integrating temporary projects into more speculative and spectacular long-term plans for a city may be a risky tactic for a citizen, alderman or developer because the pop-up project can be shut-down or hotwired. However, what could be riskier than rethinking the structuring of the urban environment is to do nothing at all.

References


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HARVEY, D. 2012. Rebel cities: from the right to the city to the urban revolution, New York, Verso.


Notes

1 Young people were asked to help design a large playground; submissions were accepted for the large transport plan and a small part of commercial development in the south of the center; and one small part of the public park along the Avon-Otakaro River was opened for feedback, and the new library led by the CCC has also had public input.

2 However some like a temporary shopping centre and a temporary stadium are likely to stay for several years yet.
Architecture Practice Research

Designing for Resilience
St. Rita: A New-Build House designed for climate change adaptation

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Mitigation Design
+
First Stage Adaptation Design
<20°C PROBLEMS

1- Summer Heatwaves with Reduced Diurnal Range
2- Heavy, Extreme and Unseasonal Weather Events
   3- Water Stress
   4- Failures + DIY

SOLUTIONS

1- Horizontal + Vertical Planning with Natural Ventilation
2- A Passive Envelope with Layered Resilience
   +
3- A very Low Carbon Eco-house
Interior Horizontal + Vertical Planning with Natural Ventilation
A Passive Envelope with Layered Resilience
GreenYard

architecture

neil@greenyard.co.uk
Amphibious Construction in the UK

Robert Barker

ABSTRACT In the UK there are currently over 5 million properties at risk of flooding with over 10,000 new properties built in flood-risk areas every year. This represents about 17% of the total property in the UK. The annual cost of flood damage is estimated to be £1.1 billion and this is expected to rise.\(^1\) The 2013/2014 floods were believed to cost small UK businesses alone, £830m.

Whilst the insurance companies are required to pay out to repair properties there is now incentive to build back better and therefore the risk of flooding is unchanged.

This paper examines if Amphibious Architecture may provide a long-term failsafe solution to UK flooding. It examines Amphibious Architecture in the context of best practice approaches to masterplanning to reduce flood-risk and climate change. It also considers amphibious design alongside other property level approaches to reducing flood-risk and reviews the design of the UK's first Amphibious House located in the middle catchment of the River Thames.

KEYWORDS: UK; floodplain; development; floating home; amphibious home, masterplanning, making space for water, failsafe solution, climate change, River Thames, middle catchment, building warranty, flood insurance.

Introduction

In the summer of 2007 parts of the UK suffered over 4 times the average rainfall for the same period in any given year. This led to widespread flooding throughout the country, particularly affecting the southwest around Gloucestershire and the midlands and east of Yorkshire.

Peak surface water run-off caused large areas of land to flood that were not previously considered to be at risk. Following 2007 the Environment Agency (who are the national organization responsible for determining and managing flood-risk in England & Wales) revised their estimate of the number of homes at risk of flooding from 3 million to 5 million. This represents about 17% of the total property in the UK.

In the winter of 2013 / 2014 storms battered the south coast of England and Wales and parts of the UK again received over 3 times the average rainfall. Large areas of the south of England were flooded throughout the winter months. The Somerset Levels flooded for the second time in two years. Both these floods were believed to be the equivalent to a 1 in 100 year (or 1% Annual Estimated Probability) event. Due to the sparsely populated nature of the levels these floods only resulted in about 600 homes flooding, despite almost 7,000
hectares of land being inundated. However, whole villages were cut off from the land and this attracted significant media attention.

In 2014, the levels remained flooded for three months. In 1872–1873, over 100 square miles (27,000 ha) were underwater for six months, from October to March. [12] Flooding is not new to the area.

![Flooding along the Thames, 2014 (source: Met Office).](image)

Fig. 1. Flooding along the Thames, 2014 (source: Met Office).

Shortly after the levels flooded the River Thames passed bursting point and large areas of the Thames Valley flooded. On the site of the amphibious house the floodwater reached a depth of almost 1.5m, halting all work for the next 2.5 months until the water receded.

Fig 1. illustrates some of the extent of the flooding, which affected several thousand homes and were believed to cost small UK businesses £830m.

Baca Architects was established in 2003. One of our founding concepts was to create architecture that could mitigate and adapt to climate change. We soon identified that one of the most significant impacts of climate change was the increasing risk and severity of flooding.

In the same way that the car influenced 20th Century City Planning, water and environmental design could change the way towns and cities are planned in the 21st Century.
As architects our role is to design buildings. Yet in the context of flood-risk we realised that there was a need to spearhead new ideas, and this required research. Since these early days we have undertaken many award winning projects, which have since gone on to influence many architects and designers work, particularly are own. The most significant of these projects is the LiFE project, but ideas from various others also continue to inform ways to manage flood-risk. We continue to use research to inform our built work some of which is illustrated in Fig. 2.

These research projects have led to several important publications, culminating with our own imminent book, titled Aquitectures. ‘Aquitectures’ outlines new ways of ‘designing for water,’ using examples from around the world to illustrate methods of utilizing water innovatively, efficiently and safely. This is a comprehensive review of the role of water in architecture, examining how we can integrate water into planning, architecture, landscape and engineering.
Perhaps it should come as no surprise that large parts of the Thames Valley flooded in 2014. This is what is predicted. The flood maps for the Thames clearly show the extent of the potential flood plain. Fig. 4 shows the flood risk maps from the Environment Agency website (2015). The areas of dark-blue indicate the high-risk areas, mid-blue the medium-risk and the areas of light-blue the low and very low-risk. Despite the potential extent and impact of flooding in Central London the risk is considered low. The equivalent flood zone map indicates that this area benefits from flood defences, which has reduced the risk from high to very low.

Fig. 4. Flood risk maps (source: Environment Agency 2015).
Mapping to the west of central London where there are less flood defences shows an increase in the extent of high and medium flood-risk areas. This can be seen to affect largely built up and highly populated areas such as Staines, Windsor, Maidenhead, Marlow, Henley and Reading.

Zooming into one area in detail we see how this risk can encompass whole neighbourhoods. In some parts of the world this can extend to include the majority of the town or city. This particular example is also the location of the Thames Amphibious House.

Fig. 5. Surface Water flood risk mapping overlaid with river flood risk mapping (source: Environment Agency).

Fig. 5 illustrates the risk of flooding from surface water run-off. In some areas this overlaps with the flood-risk from the river but in other areas it shows risk from flooding where it would not otherwise be expected. This potentially increases the risk to some areas, which are both vulnerable to fluvial, river flooding and pluvial, surface water flooding.

Considerations

In this paper we will consider three components:
1. What we can learn from research into flood-risk management
2. Lessons from the Thames Amphibious House
3. The next steps to delivering amphibious housing in the UK
Fig. 6 indicates three different sources of flooding, none of which were the river. These were surface water, surcharged sewers and ground water flooding. During the 2014 floods the ground water level was so high it prolonged the period of flooding, and hampered attempts to dry out properties.

The conventional approach to flood prevention has been to use defences, such as flood walls, dykes or levees. Whilst flood defences still play an important part in protecting many properties from river or coastal flooding they are not effective at controlling surface water run off and groundwater flooding.

As the predicted flood levels increases through rising sea levels and increased river flows, traditional defences need to rise too. This may not only become increasingly expensive, but if the predictions are wrong then flood defences may be overtopped. Alternatively, management of flood-risk to reduce the effects of flooding rather than just reducing the exposure and vulnerability to flooding may be more sustainable.

The Long-term Initiatives for flood-risk environments (LifE) approach

In 2009 we developed the Long-term Initiatives for flood-risk environments (LifE) approach to explore how building could help to reduce flood-risk and at the same time
mitigate climate change. It was funded by Defra and involved an expert team including the Building Research Establishment. Fundamental to the approach was a shift away from traditional flood-prevention towards a more non-defensive approach to flood-risk management.

The LiFE approach responds to three key considerations, as shown in the venn diagram below:

- **DEVELOPMENT PRESSURE** - the need to build new homes and businesses to support a growing and ageing population.
- **ENVIRONMENTAL CHANGE** - such as pollution, habitat loss, rising temperatures and changing weather patterns.
- **INCREASED RISK OF FLOODING** – through the rising frequency and severity of flooding and the higher numbers of people and businesses that are exposed to flooding.

![Venn Diagram of the LiFE Approach](image)

**Fig. 7. The LiFE Approach (source: Baca Architects).**

The response is illustrated by three intersecting approaches:

- **MAKING SPACE FOR WATER.** Working with natural processes to provide space for water (rain, rivers and sea) to expand during times of flood and reducing reliance on flood defences.
- **LIVING WITH WATER.** Working with nature to develop communities that are designed to anticipate, cope and recover from flooding quickly, with little cost or impact on their daily lives.
- **ZERO CARBON.** Harnessing natural resources to create low-energy developments that have a positive impact on the environment and seek to reduce carbon emissions.
These culminate with the integrated LifE approach at the core, which is: integrated spatial planning, sustainable design and non-defensive flood-risk management.

The concept is that architecture, landscape and engineering create multi-functional spaces and buildings designed such that from day-to-day they play an active part in towns and cities but when needed provide storm and floodwater attenuation.

This illustration indicates how a town may be planned to provide space for water between development, how property may be organised around central safe havens, which double as local renewable energy providers and how different construction types may be used in different areas. Close to the water properties are designed to be flood resilient, floating and amphibious. Away from the water properties are designed to absorb water with green roofs and rain gardens to reduce the risk of flooding to neighbouring properties and infrastructure.

Fig. 8 shows how space is made to store water, and for water to flow through predetermined parts of a settlement without significant disruption to peoples lives. The space along the rivers edge and between buildings, which is designed to flood, could provide other functions, such as recreation or energy generation when not flooded; thus creating multi-functional space and integrated planning. A channel diverts floodwater into a nearby pond, heightening the awareness of the potential for flooding.

The playground for the school is surrounded by a rain garden, which absorbs peak run-off before allowing it to discharge back into the watercourse.
The Climate Adaptive Neighbourhoods (CAN) Project

The Climate Adaptive Neighbourhoods (CAN) Project was funded by the Technology Strategy Board – design for future climate programme. The CAN project advanced ideas from the LiFE project by examining a wider spectrum of climate issues and assessing how buildings could be better designed to adapt to future climate.

The future climate risks were assessed for a site in Norwich using a range of tools, including the weather generator and flood flows modelling, based on two of the IPCC economic development scenarios: 2030s high and 2080s medium. The Weather Generator Project, was developed to provide future climate data for UK Climate Predictions (UKCP) also used in the Intergovernmental Panel on Climate Change (IPCC). The assessments showed a general trend towards increased temperatures, more frequent and intense heat waves and drought, increased intensity and duration of rain storms and higher flood levels. The uncertainty of the predictions was shown to increase over time.

![Fig. 9. Future flood levels projection (source: Baca Architects and JBA).](image)

The main climate risks to life and property were considered to be associated with comfort and water. Mean temperatures were shown to increase by upto 48% in the 2080s, from 9.4°C to between 11.5°C and 14.0°C. In the 90th percentile the peak flood levels were shown to increase by almost 1m, Fig. 9.
For the scheme design, this meant that buildings needed to be raised higher than previous predictions but the access to the site also needed to be carefully designed to allow people to evacuate and for emergency vehicles to access the site even when flooded. These images illustrate how buildings are laid out around narrow lanes to maximize the space for water between, resulting in a landscape rich, park setting. The animation simulates a 1 in 1000 year flood (which is well in excess of design standards) and how even during this event the roads remain dry for the majority of the time and when they do flood the depths are less than 0.3m and the flood velocities negligible, enabling safe access for fire trucks and ambulances, in accordance with Defra research. It required a lot of fine tuning of the design and remodeling to find the optimum solution.

With regards to both flood-risk and overheating we developed an adaptation strategy, in which some measures were required from the outset and others could be added to adapt to changing conditions. This is best illustrated for cooling.

Using thermal modeling to assess the effectiveness of different measures and Net Present Value calculations it was possible to determine the cost it was possible to identify a hierarchical approach to cooling. Thermal mass needed to be implemented from the outset but increased natural ventilation, solar shading, labyrinth cooling and active cooling could all be added later, and in that order to minimize cost.  

![Timeline for adaptation (source: Baca Architects).](image)
The research enabled a possible timeline for the implementation / retrofitting of adaptation measures to be developed with consideration of several issues:

- Identification of earliest time when adaptation measure may be required, based on 90th percentile probability.
- Latest time when adaptation measure is likely to be required.
- Regular maintenance periods (typically 20 years).\(^4\)

This timeline (Fig. 10) provides the triggers for investment and could be refined based on measured annual outside temperatures, tidal water level changes (influence of sea level rise), mean annual precipitation, peak annual precipitation.

**Property level protection from flooding**

In the last research project to mention here, The Flood Resilient Property, which was also funded by Defra we examined the details required to provide flood resilience. This looked at the detailing and materials required to provide both resistance to flooding and resilience to flooding in the event that water enters a property.

When floodwaters remain for a long period of time, many construction measures designed to keep water out fail at some point. This is well illustrated by a research study made by the Gulf Coast Community Design Studio and funded by the Southeast Region Research Initiative (SERRI). This research measured the effectiveness of various American building construction techniques at resisting water and the time before they each failed.\(^5\)

The key junctions of the property were detailed for various products to cope with flooding upto around 1m. Returning to the scheme in Norwich this would provide potential measures that could be added to the property to increase the longevity of its use if the more extreme predictions for flooding were to become a reality. Some of these detailed approaches have also been applied to floating and amphibious architecture.

The AJ Metric Handbook describes four different building approaches to managing flood-risk, illustrated in Fig. 11.

1. AVOIDANCE – such as elevating properties or locating them away from risk (highlighted in orange)
2. RESISTANCE – preventing water from entering the property either with permanent or active means (highlighted in red)
3. RESILIENCE - allowing water to enter the property but such that it will not cause structural or long-term damage (highlighted in green)
4. FLOTATION – a building that is constructed on a flotation device, enabling the entire property to float safely on top of the flood water (highlighted in red)
In most cases it is likely to be more cost effective to elevate properties above flood-risk or to provide resistance to flooding. However, in areas of extreme water level variation flotation structures provide a clever means of coping with flooding when required and providing access to the land at other times.

These research projects have helped to establish principles for planning in flood-risk areas, how buildings can be adapted for future climate without increasing initial capital costs and how to prevent flood water damaging buildings and the technology to reduce flood-risk in property.

The Thames Amphibious House

Formosa, The Thames Amphibious House is the 1st amphibious house to be built in the UK. It was designed by Baca Architect and Techniker. It is located on an island in the middle catchment of the River Thames in Marlow. It is downstream of a weir and the flood flows alongside the main flow of the river. The island is only accessible by foot, across a lock, or by shallow bottomed boat.

The site (shown in Fig. 12) is entirely located in Flood Zone 3b and the Annual Estimated Probability of flooding is approximately 1 in 5, ie a 20% chance of flooding in any given year.
The 1 in 100 year flood level was approximately 1.8m above ground level, rising to approximately 2.1m above ground level with climate change.

The neighbouring properties are generally one storey houses, some with rooms in the roof and most are raised on stilts. The existing (now previous) property on the site was also one storey, but like other houses it was only raised some 600mm off the ground.

The elegance of the amphibious solution is that so long as the integrity of the can-float base is maintained it is a failsafe solution, in which the building will always rise buoyed by the water.

The diagram on the left of Fig. 13 shows that the previous house had it still existed in 2014 would have been flooded to a depth of about 0.8m.

Local planning rules prohibited the building to be any taller than neighbouring properties, nor any larger in footprint. This would have meant that after raising the building above the current projected flood level it could only have been one storey. Because the client was keen to increase the size of the house, an alternative flood protection strategy was required – Amphibious Construction. This enabled a three storey 225 sqm house to be built on the site of a former 85 sqm house.

Fig. 12. Site plan and flood-risk map (source: Environment Agency).
Fig. 13. Sections of previous house (left) and Amphibious property (middle and right), © Baca Architects.

Issues

The local Environment Agency was not familiar with floating construction let alone amphibious. Baca Architects therefore presented various options and examples of other amphibious buildings around the world to demonstrate that this was a proven technology. There are limited examples of floating and amphibious construction and those that exist are relatively recent with limited experience in real test scenarios, particularly those similar to conditions on the Thames.

There were a number of issues or obstacles to overcome in construction the 1st amphibious house in the UK.

• The building needed to respect the local planning regulations. The height was limited, the building style and materials should complement the local vernacular and the building must meet the Environment Agency guidelines.
• The Environment Agency required detailed calculations to demonstrate how the structure designed for this particular location would work and the Local Authority required details to show how it would be maintained over the properties lifetime.
• Due to proximity of the watercourse, the nature of the construction and the risk of contamination there were a number of other consents required and licenses for various parts of the work.
• The most difficult challenge was the construction and warranties.
• Because there was no vehicular access and the pedestrian access is only about 1m wide, a dedicated chain ferry needed to be used to ferry materials and goods from the opposite side of the river onto the island. This also required an area of field to be hired from the farmer to use for the access.
• The chain ferry restricted the weight of materials that could be brought onto the island and due to pollution controls restricted the type of vehicles that could be brought
across. This meant that prefabricating the hull (which was the preferred method) was not possible, nor was it possible to use pre-mixed pumped waterproof concrete. This meant that the most important part of the build, the base had to be mixed by hand.

- Finally this type of building has not been built before in the UK and therefore there was no precedent for providing a warranty. A building warranty is a 10 year one-off insurance used to provide cover for new buildings against items such as structural damage or drainage failures rather than annual insurance.

The various components of the Amphibious House are illustrated in Fig. 14. There are four key components:

1. Wetdock and debris control
2. Can-float base and dwelling
3. Guide posts and running gear
4. Flexible utility connections

Fig. 14. Components of the Amphibious House (© Baca Architects).

The can-float base and dwelling sit within the wetdock. This is an excavated area, which retains the surrounding land with sheet piling and a permeable concrete base, which controls the rate of water inundation. The wet dock is hydraulically linked with the river and
the water within the dock rises at the same rate as the river level. This results in the housing rising gradually as the water table rises, rather than being subject to potential rapid inundation when the river overtops. This is one of the key inventions that most likely differentiates it from other amphibious technology.

The cross section through the base illustrates the most critical component of the calculation of the house. The weight of the house during live and unlive loading is used to calculate the variation in buoyancy level. This in turn is used to determine the depth of excavation and overlap in the structures that prevents debris ingress.

During construction the site flooded. The photograph shows the extent and depth of flooding in January 2014. This shows the adjacent properties flooded up to the floor boards. The flood water continued to rise another 0.5m in the following few weeks.

![Figure 15. Photograph in January 2014.](image)

The house has been designed to allow both visual inspection of the key parts and physical testing. During construction the house was tested twice. The amphibious construction enabled a large south facing double height façade to be created, maximizing the views over the river. The slightly raised ground floor level allows views over the garden but maintains the connection with the land and the water.

The amphibious construction enabled a large south facing double height façade to be created, maximizing the views over the river. The slightly raised ground floor level allows views over the garden but maintains the connection with the land and the water.

A profiled landscape was used to raise the ground up to meet the living floor level and reduce the ground level to create a high level clerestory window into the basement level.
dining space. The terraced garden forms an intuitive landscape, one which informs the occupant when the house is about to move, like an early flood warning.

The lightweight timber frame shell is clad in a zinc shingle tile. This is a modern interpretation of the neighbouring tiled buildings and zinc has an elegant maritime comparison, being the sacrificial material used to protect steel from rusting. The guideposts are rebated into the façade as part of the control mechanism to prevent the house from crabbing or twisting and to ensure that it rises and falls in the same location.

Fig. 16. Photos from the 1st float test (© Baca Architects).
This rebated detail extends to the roof (bottom right, Fig. 18), transitioning to glass to allow natural light into the centre of the building. The north façade (top left, Fig. 18) is clad in a composite timber and recycled plastic cladding to provide a low maintenance weatherproof enclosure and providing greater privacy for the occupants. Large sliding folding doors (bottom left, Fig. 18) open from the kitchen living room to create a fantastic view of the water, safe in the knowledge that this house will not flood.

Lessons learned

The key lesson to learn from the UK Amphibious House is where to use this type of construction.

Any machine with moving parts has a degree of complexity and amphibious construction is no different. It is still preferable to locate buildings in low-risk areas. Therefore, amphibious solutions are best suited to dealing with:

1. areas of significant flood depth,
2. uncertainty in predicted flood levels
3. areas which have a high aesthetic sensitivity – such as historic areas, or rebuilding within existing settlements.

Considering the flooding from 2014 then we can see that Amphibious Construction could provide residents with a failsafe response to flooding. Amphibious Construction may also
provide a solution for critical infrastructure, which is essential to aid flood or other disaster recovery, or for critical care units in hospitals where evacuation may not be a viable option.

Many areas at risk of flooding are only appropriate for industrial and commercial uses under current UK planning policy. Changes in planning policy are needed for the widespread adoption of amphibious technology. Alongside seeking planning reforms we are establishing building and maintenance standards to give certainty to investors, insurance companies, property owners and manufacturers.

With the next generation of UK amphibious housing Baca Architects hope to develop a lower cost prefabricated solution and a highly robust coastal flooding solution, to demonstrate its wider applicability and to resolve blighted coastal locations respectively. Fig 19 illustrates some of the prefabricated properties we are developing, which can be delivered by lorry and craned onto floating bases, or onto can-float bases to form amphibious properties. Like other prefabricated houses, these proposals should improve the quality of workmanship, potentially providing their own guarantee and therefore bypassing the need for a bespoke building warranty. Through modularisation they have the potential for widespread application of amphibious construction, particularly on new development or regeneration sites.
Fig. 18. Photos of the Amphibious House (© Tim Crocker, Freemantle, Oliver Pohlmann).
In conclusion, Amphibious Buildings have an important part to play in the flood-risk reduction of the UK, particularly in sensitive historic sites. However, their application is always likely to remain marginalised or of a small scale bespoke nature until standardisation of construction details can be used to obtain building warranties and with this major funding. The Thames Amphibious House, is one of these bespoke solutions, which at least now demonstrates that amphibious construction is technically feasible to tackle UK flood-risk.

Notes

4 Barker and Coutts, Climate Adaptive Neighbourhoods Project, TSB, 2013, p. 50.
Living Architecture: Demonstrating resilience to climate change and resource depletion

Emma Flynn
In the next 15 minutes the world’s population will have risen by 2500 people*
Research and Development

World Class Designers to ensure projects quality – Practice mentor to help challenge current thinking

CAD tools used to help test early design ideas:
- VASARI
- ECOTECT / SEFAIRA
- GENERATIVE COMPONENTS
- BUILDING INFORMATION MODELLING

In house Environmental Engineer to inform early ideas and concepts

The vision

Environment and Sustainability
Developing expertise beyond simply compliance, and pushing performance standards and behaviour change through innovation

- Context: standards, regulations, legislation
- Environmental design principles
- ED strategies – PassivHaus, Carbon Zero, Carbon Negative
- Renewables
- Embodied carbon
- Environmental modelling
- Monitoring: Occupancy sensors, BMS interfaces
- Measuring: BREEAM, audits, Post occupancy research

Digital Technology and 3D Modelling
The use of cutting edge digital tools to aid the design process

- BIM development
- Environmental analysis and simulation
- Strategies for fabricating complex forms
- Online material library and intranet. SpecifyBy
- Rapid prototyping
- Design and data visualisation
- Augmented reality, 3D scanning, Artificial intelligence

Future Cities
Wider city and global scale issues of future resilience

- Climate change impact and responses
- Supply chain resilience
- Social inclusion
- Disruptive business models
- Circular economy
- Policy
- Thought leadership

Projects include:
- Future Housing
- Living architecture
- Tomorrow’s City
- Innovators Union
Living Architecture:

1. Living Skins
2. Living Structures
3. Living Landscapes
Living Skins
### Phase change materials

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### Bioluminescent lighting

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Living Structures
Living Landscapes

Carbon – Improving soil fertility

Hello! You have landed on a mockup of our Carbon map. We are creating an interactive map of the carbon content of UK agricultural soils and we will be using this information as the underpinning information for the only carbon off-set trading scheme available to the farming community. The map content is variable and editable once you have become a member.

Carbon credit estimates for this field:

Make more money from your soil

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Micro Anaerobic Digestion

Off grid Housing

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ASTUDIO Research

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The End

AstudioResearch
Management Before Fabric:
Mal-adaptations or barriers to adapting existing buildings for greater resilience to climate change

Irena Bauman

ABSTRACT The intensity and frequency of extreme whether events will have far reaching effects on buildings. Multidisciplinary teams led by Bauman Lyons Architect applied detailed reiterative computer modelling to a comprehensive range of adaptations to different building typologies to establish an adaptation strategy in anticipation of increasing overheating caused by climate change. The modelling revealed that existing commercial buildings can be successfully adapted to climate change and that the payback period of such adaptations is commercially viable. Even more surprisingly, the research also established that through these adaptations buildings could be weaned off air conditioning on which they currently depend. However, the study also revealed a high number of institutional barriers to acting on this knowledge. This paper explores the case for adaptation and the three types of barriers - collectively referred to as maladaptations – that stand in the way of retrofitting buildings for resilience to climate change:

Existential: Denial about potential climate change impact. This is true of individuals as well as of institutions. The denial takes the form of negation (it will not happen), denialism (protection of institutional interests) and disavowal (knowing that climate change is happening but inability to come to terms with the need for action).

Management: Client management structures and decision-making processes do not accommodate the potential for strategic planning for climate change. Properties are managed through uncoordinated and disjointed decision-making. Budgets for maintenance that could be used to implement adaptations to improve comfort and reduce running costs, are set annually determined by what has happened in the years before rather then what lies in the years ahead.

Legislative: Lack of policy incentives; conflict between current building regulations based on the need to conserve energy and the benefits of high thermal mass for keeping buildings cool in future climates. Conflicts also with planning legislation.

KEYWORDS: Climate change; adaptations; maladaptations; resilient building design.

Introduction

A recent report by the Intergovernmental Panel on Climate Change (IPCC 5)1 confirms the climate trends that make adaptation for resilience important and urgent. Research into adaptation of buildings has been enabled through newly available data such as UK Climate Projections (UKCP09)2, weather scenario probabilities3 and Prometheus Weather Files,
new modelling tools such as IES and Designer Builder and emerging concepts such as The Adaptive Thermal Comfort (ACT) that offer new insights into the nature of human comfort.

*Management before Fabric* is one of forty-five industry led research projects commissioned by Technology Strategy Board (TSB) within their Design for Future Climate: Adapting Buildings programme between 2010-2014. This Climate Change Adaptation Study focused on the office accommodation within the National Media Museum in Bradford UK on floors 7 and 8 of a 1960's library building. The offices were to be open plan and connected internally by a new void created in the floor plate between the levels. The main area of concern for the complex of buildings was the overheating of the mechanically ventilated office space.

The research aimed to develop an adaptation strategy to prevent future overheating whilst reducing and eliminating dependence on mechanical solutions. Other aims included the use of passive solutions with simple mechanical user centered controls; consideration of orientation related design solutions; consideration of an incremental floor by floor adaptation strategy; demonstration of commercial benefits, if any, of the strategy and review of organizational structures required to embed climate change adaptation into estate development planning.

The adaption strategy applied to floor 7 and floor 8 of a 9 storey 1960's building constructed as a concrete frame with cast concrete floor slab and coated, single glazed infill spandrels to south and north elevations and Portland Stone facing to east and west gables. The floors plates are approximately 800sqm with all office fenestration located on the south and north elevations (Figs. 1 and 2).
Future weather and climate prediction data was used for modeling but consideration was also given to other predicted trends such as improvements in energy use of IT, technological improvements in glass and other materials; human capacity for adaptation to heat; trend for increased occupancy levels in managed office space, increase in the use of IT; increase in energy costs and predicted increase in extreme weather events.

19 adaptations were modeled in many permutations. The strategy for adaptation incorporates incremental adaptations aligned with maintenance cycles to various elements of the elevations and to services to secure a natural ventilation solution for up to 2080 to prevent overheating whilst reducing the carbon emissions and running costs of the building and working with the environmental controls preferences expressed by the current building users. Adaptations that help reduce overheating have been identified as: increased thermal mass (e.g. phase change material), trombe wall; improve glazing G Value; external louvers; solar control blinds; infilling a third of existing windows; external shutters; night purging; openable roof lights; openable windows; three designs for composite facade panels; ceiling fans; reduce occupancy levels. However mal-adaptations (adaptation that would increase overheating) were also identified: raised access floors, super insulation, increasing occupancy density- all of these can be designed out. However other mal-adaptations were also identified that can only be dealt with through change of behavior and of legislation- these are discussed in a second part of this paper.

The study identified three key phases for adapting the building. In phase one existing windows would be replaced with a new facade of composite panels installed on the south and north facades with low g-value glass, hopper window with actuators enabling night purging. This retrofit would reduce solar gain of the windows, allow natural ventilation and allow the building to be cooled at night. Openable roof lights would be added when further cooling becomes needed.

In phase two, around 2050, a new composite facade with a greater area of opening area to allow increased ventilation and better user comfort control is installed. Below the windows an adjustable grill provides further natural ventilation control when the windows are closed; hopper windows would be provided for night purging; all windows would be inward opening to allow for a manually adjustable louver system to run externally. This design would allow a view out, reduce solar gain and enable windows to be fully opened on warm, wet days for natural ventilation.

In phase three, between 2055- 2080, de-stratification ceiling fans will be installed on both floors- these do not lower the temperature but the air movement creates a cooling effect of up to 2deg.C. It’s a very effective and low cost method of providing localised relief to
overheating (Fig. 3). The calculated whole life cycle costs of this strategy indicated an overall saving of £1,140,000 in 70 years, which is an equivalent of £16,300 per annum.

There is an estimated stock of 566 million m² of commercial buildings in England and Wales. Many of these buildings would benefit from a climate change strategy to improve their performance and commercial viability.

Around 60% of the non-domestic buildings in use today will still be in use in 2050 according to The Carbon Trust. Of the £46 billion in the Investment Property Databank (IPD) Office Index, over 90% is more than 10 years old. As such, the building stock, therefore, is highly unlikely to be carbon efficient or comply with current or forthcoming legislation. Over the next five years, 33% of the leases in the UK market will expire. Verdanix estimates the total potential addressable market for the green retrofits to be £14 billion of investment over this period representing in the region of £820 million of annual rental income.

This adaptation strategy could apply to all spaces on a floor by floor basis as well as to whole buildings, which are experiencing, or will experience in the future, problems with overheating. The floor by floor approach could be applied to various areas of a wide range of buildings, from housing and education to offices, areas of retail and industrial, even in buildings which cannot be adapted in their entirety. Also it is possible to adapt selectively only those elevations most adversely effected.
Fig. 3: Timeline of adaption strategy.

The buildings most likely to benefit from adaptation come in four broad categories: those buildings constructed to function without air conditioning but expected to overheat due to rising temperature and increasing internal gains; buildings constructed with air conditioning necessitated by extensive use of glass; buildings with air conditioning necessitated by acoustic issues that may change as we move towards electrical transport, pedestrianisation, and changing priorities and buildings which are inherently low carbon but have mechanical cooling installed for a variety of historic reasons. These reasons include a variety of ills such as the market generated expectations of the A grade office specification; the quota of renewable energy required by Planning Departments that inadvertently encourages installation of air source heat pumps whose high capital and running costs are often justified to the client on the grounds that the system can provide both heating and cooling; legislation (such as Building Regulations) that tolerates air conditioned building and encourages ever increasing insulation and air tightness and poor design practice arising from inaccurate assumptions and broad-brush approach to modelling practice.

Throughout the research project, which was focused on simulation through modeling, we perceived little interest from policy makers and from the industry, despite evidencing that
many commercially beneficial adaptations are possible. We perceived three possible causes of this failure: Existential, Management and Legislative.

There is a widespread denial about potential climate change impact. This is true of individuals as well as of institutions. The denial takes many forms of negation (it will not happen), denialism (protection of institutional interests, political and business, in retaining the status quo) and disavowal (knowing that climate change is happening but inability to come to terms with the need for action) (Sally Waintrobe ed. 2013). More recently other concepts are emerging from the field of psychoanalysis such as that of 'un-care' suggesting that individuals both care and not care and that these sides do not communicate with each other (Sally Waitrobe 2014). Most recently new word has emerged that traces our slow progress out of denial: the lukewarmers are a group that believes that the climate is changing but is relatively insensitive to the increasing greenhouse effect, and hence that climate change will proceed slowly enough as to not be a serious concern in the near future. In society's current state between denial, un-care and lukewarmness, adaptation of the built environment is not high on the agenda.

There is also failure of management. The external political and financial imperatives override the significance of scientific findings. The Management before Fabric study coincided with dramatic downturn in the economy and the austerity policy. Furthermore, more specifically to the research project, there were also complex management changes taking place within client organization, which created a great deal of uncertainty and made it difficult to finalise decisions. The study identified distinct mal-adaptations due to management:

**Structure of the organization**

The management of the National Museum of Media (NMM) fell, at the time of the study, within an umbrella organization of National Museums of Industry and Science (NMIS). The decisions regarding investment into the fabric were split between the two organizations in that NMS had to bid each year to NMSI for maintenance funding. Capital funding did could only be secured through annual projects and the priorities for projects were set by NMIS not NMM.

**Organizational priorities**

The priorities for NMM and NMSI were the Collections and The Visitor Experience. The running costs, although of concern, where not on an immediate priority list for the organization. Climate change adaptation did not even feature on planning for the future.
Decision making in the organization

NMSI Enterprise was the organization within NMSI responsible for all facilities management issues - they were the ones holding the maintenance and project funding. The organizational structure consisted of a Chief Operating Officer (located in London), supported by Head of Estates (London) supported by Head of Estates North (York) supported by Project managers in York responsible for Estate Projects of which NMM was one. Head of Estates North was aware of the research findings, but had no mechanism for communicating these to the management layers above where the ultimate decision on funding would be made.

Lack of stability within the organization

At the time of our study this structure was undergoing major changes with a number of key appointments pending and some staff acting up on a temporary basis. There was literally no one who could make a final decision about investment and it appeared that due to maternity leave and dates for reorganization this situation was to continue for another 12-18 months.

Lack of a Strategic Plan for Environmental Sustainability

The organization did not have a plan for reducing energy or improving the use of other resources, despite having a sustainability officer. Ownership of decisions Within NMI we had good access to different departments: Collections, Programme and Visitor Experience. However some of the key operational strands such as cleaning, security, services, catering and ICT were sub-contracted out. This seemed to have created a culture of silos with no one being able to take full responsibility for driving through new thinking.

Lack of knowledge of climate change and sustainability issues within the organization

There was very little understanding of energy, sustainability, and climate change issues within the organization. The sustainability officer was appointed as an internal candidate having previously been exhibitions technician at the museum. His main area of activity was to carry out small projects to reduce carbon omissions such as installing LED lighting.

BMS

The tools already available to the museum, such as BMS, was only used to control the conditioned spaces rather than to monitor and find savings in energy use – this was symptomatic of lack of optimisation of thinking and planning throughout the organization.
Finally there were also legislative failures were made worse by current building regulations encouraging high levels of insulation to the detriment of high thermal mass that would help to keeping buildings cool in future climates. The legal imperative to improve Energy Performance Certificate (EPC) and the public perception of the museums energy performance lead the museum to prioritise the addition of insulation to achieve shorter term performance gains thus locking the building into the likelihood of even greater overheating. Furthermore, optimised adaptations for each orientation were not acceptable to the planning authorities who were reluctant to accept such solutions since the original 60’s building did not make such distinctions between the elevations.

Conclusion

This research was one in a programme of forty-five that analysed the drivers that affect the market for professional building design services to ready buildings for the changing climate. The body of research develops the business case for adaptation to move from niche research to mainstream. Although we now have data and tools to allow us to demonstrate that adaptation is necessary, possible and commercially viable, we have not yet carried out research into the ways of modelling the additional risks presented by management structures that are not fit to embrace the need for and to deliver climate change adaptation and are in fact increasing the problems by continuing to procure building stock that will become 'stranded' assets of the future. There is no plan now of how the construction and property industries will adapt to tackle climate change and no recognition by the industry of the structural failings in the client organizations that this research identified. The incentives to plan for adaptation of building assets need to come from the government but the knowledge of why and how to adapt needs to be continually developed by professional institutions in the built environment, academic researchers and commercial suppliers to the industry.

There is a duty on designers to understand climate change and to develop skills that will allow them to design solutions. For architects this means investing in software and training to operate environmental modelling software in full understanding of the data that is used. It means integrating future climate change adaptations into the earliest designs decisions. The collaboration of design team, client and change-management specialist should be the way forward and adaptation strategy should be incorporated into Maintenance Manuals as a standard requirement at handover of a building. This, in turn, requires rethinking of the relationship between architects and service engineers with a view to much greater day-to-day collaboration on design and for the RIBA to modify the RIBA Plan of Work to reflect the different approach to work stages in adaptation work. We also need further research into adaptation strategies and for the results of all case studies such as this one to be widely
disseminated, including the whole life costs data, to help to make the case for ‘adapt and save’ strategies that are environmentally essential and commercially savvy.

Notes

2 The UK Climate Projections (UKCP09) website is the leading source of climate information for the UK and its regions. It is designed to help users with the process of adapting to a changing climate.
4 Design for Future Climate group – all project: (Online), available: https://www.google.com/fusiontables/DataSource?docid=16mAXZvEplwjGUU8ANvrhAQxL4s9N5-4-cquKkTk#rows:id=1.
Holzmarkt Village:
Participatory neighbourhood development in Berlin
Nanni Grau, Silvia Carpaneto, Frank Schönert, Christian Schöningh

ABSTRACT By 2025, Holzmarkt in Berlin will be developed into an innovative inner city quarter, whose guiding vision is the close integration of nature, culture and work. Nestled in the “Mörchenpark”, a public green corridor located along the banks of the Spree River, the quarter comprises three central elements: a hotel, a technology startup centre called “Eckwerk” and the “Village” as a commercial complex including a club and restaurant, which will be explained in more detail below.

Holzmarkt Village is situated on the former riverside premises of the legendary BAR25. After a five-day, non-stop party, the venue was closed in 2010 so the property could be sold to the highest bidder.

In 2012, seven bar owners prepared a development concept, founded a cooperative and secured an investor. Participating in the auction process, they outbid the commercial investors and were awarded the contract for the property, which they committed to develop over a ten-year period.

KEYWORDS: Participatory planning; modular building; Bar25; halls and huts; successive growth; participatory urban development; creative economy; small-scale structures; self-build; self-help construction; workshops; teamwork.

Introduction
The property Holzmarktstrasse 25 is located on the banks of the Spree River in Berlin, a 10-minute walk to Alexanderplatz. During the 19th century, the industrial site was used as a timber market that supplied the Berlin construction industry. Later it was home to a gasometer that supplied the city with energy. After the Second World War, the site was incorporated into the so-called “death strip” between East and West Berlin.

In the 1990s after the fall of the Berlin Wall, plans were drafted for the large-scale development of the area under the branding “Mediaspree”. International investors were recruited to establish communications and media businesses along the Spree River with the aim of high-density development. The majority of the former industrial properties were to be transformed into office buildings, apartment lofts, hotels and high-rises.

The collapse of the real estate market and the oversupply of commercial properties in the city in the early 2000s slowed speculative development in this area. Numerous temporary uses of this urban area followed, enabling an alternative club culture to flourish. Among these was Bar25, which became a symbol for hedonistic youth culture and “Easy Jet” party.
tourism.

At the same time, massive public protests led to the “Spree Riverfront for All” referendum in 2008. The citizen-led initiative called for a minimum distance of 50 meters from the riverbank for all new buildings and a ban on high-rise buildings along the Spree riverfront running through the district of Kreuzberg. City and municipal authorities and politicians were placed under considerable pressure to take action.

From beach bar to urban quarter

Bar25 (Fig. 1) launched in 2003 with a single caravan selling select whiskeys and playing Techno music. By 2010, the site had developed into a diversified leisure business. Structurally, it was a complex consisting of construction trailers and wooden huts styled after American saloons, which were expanded and remodelled over the years. The club’s playful atmosphere, which was the centre of life for its many employees and guests, is depicted in the documentary film Bar25 – Days out of Time, which premiered in German cinemas on May 3, 2012.

At its peak, Bar25 was a playground for adults, nature park, ravers’ paradise and legendary destination for thousands of travellers to Berlin, as well as a cultural and sociological experiment, rolled into one. Taken as a whole, it embodied a kind of Berlin Neverland: an autonomous, magical arena with its own radio station, restaurant, wellness
area, hostel, open-air cinema and circus tent with a stage for concerts, as well as private accommodations, since many of the employees lived on the premises. Some of the world’s most famous DJs spun their records there.

Bar25 was a temporary venue, and every autumn it held a farewell party. For several consecutive years, it succeeded in renewing its lease and extending its permit with the city. This ended in the fall of 2010, when it was decided that the site should finally be vacated for soil decontamination, and then sold unencumbered to an investor. Bar25 was history.

Bar25’s operators then moved to the opposite side of the Spree River, where they developed an abandoned factory building under a two-year lease. There they opened a similar complex with its own legendary club, KaterHolzig. In the meantime, they upheld their dream of establishing a permanent place for community-based living and working.

After a few failed attempts, their efforts to regain their old premises met with success. With the support of experienced project partners, the group of seven initiators won the public tender for the property, and its owner is now a Swiss retirement fund. The initiators were granted the building rights for their project as a cooperative legal entity. Following their camp of huts and trailers (Bar25) and the conversion of an abandoned factory (KaterHolzig), their next undertaking would be the construction of a new urban quarter: Holzmarkt.

Holzmarkt Village – concept, design, planning

The Holzmarkt project consists of three main components:

At the western end of the property will be the Eckwerk, a startup incubator and dwelling for students, startup founders, artists, researchers, entrepreneurs, programmers, craftsmen, etc. A hotel will be at the eastern end, offering possibilities for temporary stay that range from napping berths to longer-term suites. In the centre is Holzmarkt Village, a commercial complex including a restaurant, club and the Mörchenpark.

The planning and development of the Holzmarkt have been conceived as a long-term process. Building on the experience gained from the earlier temporary use projects, Holzmarkt Village is designed to organically grow and change. It should be a vibrant, long-standing and sustainable quarter that embraces diversity, fragmentation and change; a dynamic, innovative quarter whose guiding principle is the close integration of natural public space, culture and work. The village will have public pathways and rest areas, small businesses in shops, ateliers and studios, as well as bars, cafés, galleries, a childcare centre and the “Kürsche” (a community and meditation space), a club and a restaurant. This complex of small-scale structures is complemented by four open plan Halls, accommodating a wood and metal workshop, a market and event space, music studios, and a practice space for aerial artists, respectively.
All areas will be accessible to the public and barrier-free. A “mountain path” crosses the village elements at various levels with a system of pergolas from which the Huts can be entered, reminiscent of narrow lanes running through a village.

In contrast to the high-rise constructions that were initially intended by the city for this area, Holzmarkt is characterized by low density, permeability and a variety of building forms and façades that will be developed through participatory planning and construction processes. A majority of the buildings will be sustainably built using wood and clay.

Simple, cost-effective construction, partially implemented through self-build measures, will also ensure affordable rents for artisans, artists and other creatives in the city centre. The planned one- to five-storey buildings have a significantly smaller cubic capacity than the originally approved municipal development plan, the so-called B-Plan. The site will be developed gradually without reaching a structural final state: all elements are subject to ongoing change.

To expedite the approval process, the buildings will be erected within the building boundaries delineated by the B-Plan V-76 from 2006. Working within the B-Plan allows the project to circumvent some of the general setbacks required by the Berlin Building Code.

By positioning the buildings at different angles to one another, a variety of public spaces will be created, offering several points of entry and vistas to the river, the so-called “Spree windows”. The village will also open itself up to the city and opportunities for future development of the bordering neighbourhood.

Despite its heterogeneity, the development along Holzmarktstrasse will comprise a coherent morphology, decreasing in height as it approaches the river.

Public spaces/ Mörchenpark

The uniqueness of the village is strongly influenced by the publically accessible Mörchenpark. The park spans the site with a network of diverse open spaces linked by prominent green corridors, introverted lanes, the mountain path leading across green roofs on the Halls and Huts, as well as land for urban agriculture. A Spree riverfront promenade will run through the park, joining it with the public urban space. This trail will lead across the green roof of the recessed riverside restaurant, and pass by the club.

Mörchenpark will be a testing ground for participatory spatial design, permaculture, urban farming and more. Gardening and educational projects will aim to facilitate and encourage learning and knowledge transfer in the fields of environment, sustainability, organic cultivation of vegetables and plants, as well as natural conservation.

Halls and Huts concept

In response to the clients’ needs and wishes, the Halls and Huts concept (Fig. 2) is based
on an infrastructure of four large-scale, communally used and interconnected buildings – the Halls – complemented by an undetermined number of small, autonomous and individualized units – the Huts.

Fig. 2. Hardware – software concept.

Four Halls form the urban and infrastructural backbone of the settlement, which are interconnected through access points such as stairways and bridges. These two- to four-storey, reinforced concrete frame structures will be made from low-cost, prefabricated elements that can be quickly and easily erected. They will provide large, affordable spaces to house artisanal workshops, a market and event hall, music studios and a rehearsal hall for aerial artists. The Huts will be supplied with media, electricity, water supply and sewerage through central lines from the Halls.

Over the course of time, the Halls will be expanded and reshaped by the Huts. Up to two Huts can be stacked on top of the Halls, and up to three Huts can be stacked on the ground, alongside the Halls. These small units, made from prefabricated timber frame shells, will be built on-site in the workshop hall. The modules can be used as a single room or combined into multi-room structures. They are designed so that users can customize both the façades and interiors according to preference and needs.

The project’s underlying structural principle is the development of a robust, structurally constructive and spatial structure that serves as a framework for potential spaces, and which is open to DIY customization, spontaneous planning and unforeseen changes of use.

The modular structure of the Huts and Halls is based on a principle of self-organisation. It can adapt procedurally and situationally to the changing needs and users. The architecture is conceived according to structuralist ideas as a controlled, open-ended process. Steady growth and change are integral to the concept.
Participatory planning process – adaptable concept, actively involved stakeholders

The plans for Holzmarkt Village were developed in a process that involved the participation of many voices. The architects (carpaneto architekten, Hütten & Paläste Architekten and urbain affairs) put together a team with complementary skillsets in order to plan the future urban quarter with the cooperative client.

Thematic workshops were used to formulate the objectives for Holzmarkt from a variety of perspectives. The building density was specified, a user structure was defined and the needs of potential users were aligned with financial resources. Building materials and construction methods were compared, issues surrounding the private and public spheres were discussed, and the development and construction phases were outlined.

The first step was to establish structures for project-specific work and decision making. Small, two-person teams were responsible for the development of the various program points: club, childcare centre, restaurant, park, event hall, and small businesses in the village. Results were then discussed and decided in a larger round (7 to 10 people) – not according to majority rule, but consensus. During the process, the planning teams were expanded to include additional staff.

The structural organisation of the project into Huts and Halls was determined at a very early stage. Its simplicity and adaptability enabled quick reactions to variables and changes during the planning process (regarding concept, urban development, planning law, etc.). It was the red thread that guided stakeholders through the planning process. The settlement’s clarity and vision will continue to be seen and experienced for years to come, even as it changes and grows.

As a visualization aid, a model of Holzmarkt Village was built and actively used, especially in the work with the clients, providing an immediate opportunity for them to try out and test alternative configurations. The model was regularly updated to reflect current developments.

Also early on, a detailed itemization of costs and building methods was clarified directly with the precast concrete manufacturer that is now in charge for erecting the Halls.

Planning was then cleared with the authorities. Without the favour of the Friedrichshain-Kreuzberg district mayor and building authorities, as well as the willingness to experiment on the part of the specialist engineers, particularly in the area of fire safety, the project could not have been planned in its current form. The building permit was issued on April 1, 2014.

The most critical contribution to the realisation of this project is and remains the willingness of the alternative Swiss pension fund Abendrot to place its trust in the people on site, who are investing their energy in this dream-come-true project and open experiment.
Cooperative organization

The Holzmarkt vision is reflected in its corporate structure. Entrepreneurs, cultural workers and supporters have come together in a cooperative network, in order to foster the sustainable development of Holzmarkt as an urban quarter. By acquiring cooperative shares, citizens and investors can participate with their vote in the development of Holzmarkt under the premise of “share don’t own”.

Holzmarkt adds value to the city

At Holzmarkt, land is not seen foremost as an object of financial speculation, but rather a resource for the development of an experimental neighbourhood dedicated to the common good. This is been made possible through the acquisition of the property by a pension fund, which has granted the Holzmarkt makers a long-term leasehold. This arrangement minimizes the financial pressure to repay land acquisition loans through commercial exploitation.

It also allows the site to develop not from a marketing perspective, but from that of a caring owner, and to add value in various ways.

This includes the creation of public spaces, such as squares and lanes as well as a park. Holzmarkt will generate at least 200 jobs with social security benefits. An additional 600 workers will be employed by tenants and leaseholders. There will be affordable housing for students. By integrating startups and research into its concept, Holzmarkt aims to be a model project that attracts international businesses to Berlin. The participating cooperative ensures possibilities for group decision-making and action. Both citizens and investors will contribute to sustainable financing. The childcare centre will have capacity for 30 children.

The project will serve as a forward-looking biotope, with professional and highly productive urban agriculture that will establish an on-site producer-consumer community for residents, gastronomy and village shops.

Sustainability is often thought of in terms of longstanding ecological compatibility. At Holzmarkt, sustainability – and perhaps more importantly, resilience – is manifested in the structural variability, construction methods, and use of a leasehold that secures the content and mission of the project and thus the city’s return on investment for 99 years.

Cities need experiments

Holzmarkt Village is already partly in use and the first Halls and Huts are being built in 2015. The implementation of this particular project is based on a unique constellation of experience, property, opportunity and a group of idealistic actors. However, the chances for this kind of project on the free market are sinking in the face of increasing economic
pressures caused by the current development of property prices throughout Europe’s major cities.

But cities need experiments in which new forms of working, living and co-existence, financing and participation can be tested on real property. As such, the Holzmarkt project is an important architectural, social and economic experiment and research object.

What roles can architects and designers play, in the broadest sense? They can contribute their creative skills and experiences to adventurous processes and raise the social awareness of human capital. They can be a part of developmental processes that trust in the public, embrace risk-taking and believe in a common future.

For resilient inner urban development, cities must become aware of the soil as a public treasure to be preserved for the public. Citizens should demand their natural right to participation and engage in the development of their city and its land.

Fig. 3. Night view Holzmarktstrasse, 2020.

**Key data**

Surface area of Holzmarkt Village: 8,500 m²  
Thereof, public and green spaces: 5,000 m²  
Undeveloped green corridor along the Spree riverbank, 10 to 35 m wide, gross floor area (GFA a+b): 11,350 m²  
Thereof:  
- Huts 3,000 m²  
- Halls 4,700 m²  
- Club 2,800 m²  
- Restaurant 850 m²
City Debate

From Home to City: Scales of Resilience
ABSTRACT Challenges such as increasing population and ongoing climate changes require us to radically rethink our approach to urban development of the cities. Cities have to operate on a higher strategic level with a focus that goes beyond the individual projects. The leadership in the cities has to look at the long term perspective to create a resilient strategic framework for the future city development - a framework that will ensure the future cohesion in the city. At the same time, we need to engage the different stakeholders and invite them to take active part and ownership in this process.

"From City Municipality to the Neighbourhoods" will centre on three citywide strategies concerning urban life, urban nature, and climate adaptation, respectively. I would like to discuss how these strategies generate cohesion between the different local environments and the residents in the city, as well as how the local initiatives affect the strategic framework that creates cohesion in the city as a whole.

My presentation during the City Debate will include examples from the Copenhagen Climate Resilient Neighbourhood and introduce some of the many players that are involved in the local development process.

Copenhagen Climate Resilient Neighbourhood

The Skt. Kjelds Neighbourhood is known internationally as Copenhagen's first climate resilient neighbourhood. It is a temporary, area-based initiative where the urban experience is improved by combining cloudburst management and new urban spaces.

With the residents as active partners, a series of innovative demonstration projects are realised and serve as inspiration for the surrounding city. The projects include Taasinge Square which is the first climate resilient square in the city, and Ostergro roof farm, an urban organic rooftop garden involving the neighbours in cooperative urban agriculture.
Self-Made City
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**ABSTRACT** Self-Made City is about alternative mechanisms of urban development. The success of our cities in the future will hinge upon how we utilize further development to improve urbanity—with an adequate amount of suitable, affordable housing and planning that meets our growing ecological challenges. The housing markets of our major cities are determined today however, mainly by profit-driven developments. New alternatives offer the increase of choice and reduction of costs at the same time—projects that help to foster neighborhoods and to enable affordable, adaptable, customized living solutions. Collective projects in the form of co-housing, associations or other alternative development models, help to meet this challenge and have produced an architectural quality and urban diversity in recent years that is exemplary.

Sustainable development involves not only high-quality, resource saving and flexible design, but must also add to urban vitality by considering social issues of inclusion and community as well as hybrid uses that fuel urban interaction. Through active participation, future users develop a vested interest in the building, community and neighborhood that goes beyond their own personal needs and surroundings—active users being the key in determining the success of sustainable concepts. The kinds of benefits these projects bring and that are needed for vibrant, livable, sustainable cities can be looked at under three main themes: Inclusion and Community, Urban Vitality and Quality of Life, as well as Experimental and Resource Saving Design. These points and many important qualities will be illustrated with best-practice examples that show how initiatives can be scaled-up to have a large-scale and lasting impact on sustainable urban development.
ABSTRACT: The neoliberal production of the built environment, with its focus on short term gains, its opaque way of accounting for its processes (e.g. without externalizing the cost of environmental damages), and its individualistic nature, is unsustainable and unjust. Collective endeavors within cities seem like an antidote to the isolation of the neoliberal city and an essential ingredient to create a shift towards a more just city. Lefebvre points to the potential of the ‘lived spaces’ of everyday life to resist the abstract space’ of the neoliberal city, with collective endeavors creating a particular type of ‘concrete’, ‘lived spaces’, challenging and undermining the production of ‘abstract space’ (Lefebvre 1991).

What do we need to enable and facilitate collective processes in the city? How can we instigate and sustain such endeavors? How can collective endeavors outlast their initial momentum? What are the ethical challenges that these initiatives face?

The proliferation of bottom up initiatives through which communities take charge of at least some aspects of the production of their built environment will be discussed in relation to the notions of scale, capacity and currency, in an attempt to unpack the complexities and to reveal tensions around what is often taken at face value. Drawing from personal experiences of practice and research in the city of Sheffield, and focusing in particular on the Portland Works Project - a heritage site purchased through community shares - this talk will put forward thoughts for a framework to support the emergence of and sustain collective action and learning in the city. Support systems for collective action will be proposed as a way to ‘strengthen the signal’ of small, perhaps marginal initiatives, as they have the potential to create positive feedback loops and trigger the emergence of a more equitable and vibrant city and society. Crucially the challenges to the longevity of those initiatives will also be discussed alongside thoughts for mitigating those challenges.